

Contents—Nov. 1943

Volume XXIV

No. 11

ARCHIVES OF PHYSICAL THERAPY

30 North Michigan Avenue, Chicago 2, Illinois

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the Executive Office, 30 N. Michigan Ave., Chicago 2, Illinois. The statements in the manuscripts published in the ARCHIVES OF PHYSICAL THERAPY, are made solely on the responsibility of the author. The American Congress of Physical Therapy does not assume any responsibility for statements contained therein. Manuscripts accepted for publication in ARCHIVES OF PHYSICAL THERAPY, are for exclusive publication and may not be published elsewhere.

OFFICERS

American Congress of Physical Therapy

KRISTIAN G. HANSSON, M.D.,
New York, N. Y., President.
MILAND E. KNAPP, M.D.,
Minneapolis, President-Elect.
WALTER S. McCLELLAN, M.D.,
Saratoga Springs, N. Y.,
First Vice-President.
*H. WORLEY KENDELL, M.D.,
Chicago, Second Vice-President.
*KENNETH PHILLIPS, M.D.,
Miami, Florida, Third Vice-President.
*O. LEONARD HUDDLESTON, M.D.,
Denver, Colo., Fourth Vice-President.
EARL C. ELKINS, M.D.,
Rochester, Minnesota, Fifth Vice-President.
RICHARD KOVACS, M.D.,
New York, Secretary.
JOHN S. COULTER, M.D.,
Chicago, Treasurer.
WALTER J. ZEITER, M.D.,
Cleveland, Executive Director.
MARION G. SMITH, B.Sc.,
Chicago, Executive Secretary.

EXECUTIVE COUNCIL

Fred B. Moor, M.D., Los Angeles, *Chairman*.
*Norman E. Titus, M.D., New York, N. Y.,
Secretary.
William Bierman, M.D., New York, N. Y.
John S. Coulter, M.D., Chicago.
James C. Elsom, M.D., Madison, Wisconsin.
Frank H. Ewerhardt, M.D., St. Louis, Missouri.
Roy W. Fouts, M.D., Omaha, Nebraska.
John Severy Hibben, M.D., Pasadena, Calif.
Abraham R. Hollender, M.D., Chicago.
Disraeli Kobak, M.D., Chicago.
Frank H. Krusen, M.D., Rochester, Minnesota.
Nathan H. Palmer, M.D., New Orleans.
William H. Schmidt, M.D., Philadelphia.
Albert Frank Tyler, M.D., Omaha, Nebraska.
Frederick L. Wahrer, M.D., Marshalltown,
Iowa.
Kristian G. Hansson, M.D., New York, N. Y.,
Ex-Officio.

EDITOR EMERITUS

DISRAELI KOBAK, M.D.,
Chicago.

* In Active Service.

Subscription — In the United States, its possessions, and Mexico, \$5.00 yearly; Canada, \$5.50; elsewhere, \$6.50 the year. Advertising rates on application. All advertising copy subject to acceptance by publication committee.

Published monthly at Chicago, Illinois, by American Congress of Physical Therapy. Entered as Second Class Matter, January 29, 1938, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879.

ORIGINAL ARTICLES

Causalgic States Following Injuries to the Extremities
.....Geza de Takats, M.D. 647

Discussed by Drs. Earl Elkins and G. de Takats.

Physical Treatment of Disabilities of the Foot Commonly Encountered in Military Service.....
.....Capt. Thomas E. Dredge (MC) A. U. S. 653

Some Thoughts About Shock Therapy.....
.....Clarence A. Neymann, M.D. 660

The Nature and Chemical Action of Ultraviolet Light
.....G. K. Rollefson 664

The Treatment of Shock with Special Reference to the Use of Heat and Cold.....Warren H. Cole, M.D. 670

Rehabilitation.....Harry E. Mock, M.D. 676
Discussed by Capt. Samuel R. Rubert (MC) and Dr. Harry Mock.

Special Article—Volunteer Physical Therapy Assistants 679

Editorials 681

Correspondence 683

Medical News 684

Book Reviews 690

Abstracts 694

EDITOR OF THE MONTH

ARTHUR L. WATKINS, M.D.

Boston, Massachusetts

CLASS OF SERVICE
This is a Radiogram Telegram or Cablegram unless so directed otherwise to be delivered by a suitable method of sending the address.

BY DIRECT WIRE FROM
**WESTERN
UNION**

RATES	
Day	10c
Night	10c
Weekend	10c
Special	10c
Emergency	10c
Priority	10c
Express	10c
Radio	10c
Teletype	10c
Wireless	10c
Other	10c

The following rates are in effect for telegrams and day letters in STANDARD TIME on basis of origin. Time of receipt in U.S. and other points of destination.

LONG WUC6 GOVT LG=WASHINGTON DC JUN 3 1943 627P
TO THE MEN AND WOMEN OF THE GENERAL ELECTRIC CRAY CORP.

A FINE TESTIMONIAL TO THE VALUE AND EFFICIENCY OF YOUR MODEL F3 SHOCKPROOF PORTABLE X-RAY AND FLUOROSCOPE UNIT HAS JUST BEEN RECEIVED FROM THE COAST GUARD CUTTER "SPENCER" WHICH RECENTLY SANK A NAZI SUB AND CAPTURED MORE THAN 40 OF ITS CREW IN THE NORTH ATLANTIC. THE MEDICAL OFFICER OF THE CUTTER STATED: "SOME OF OUR MEN WERE WOUNDED WITH SHRAPNEL IN SPITE OF THE FACT THAT OUR SICK BAY IS CLOSE TO A 5" GUN, THE FIRING OF WHICH SHATTERED ALL ELECTRIC LIGHTS IN THE VICINITY, OUR GE X-RAY AND FLUOROSCOPE UNIT NEVER FAILED. THROUGH ITS USE, WE WERE ABLE TO DETERMINE AND TREAT THE MOST SERIOUS CASES FIRST. AS A RESULT ALL OF THESE MEN WERE SOON BACK ON DUTY." THE COAST GUARD CONGRATULATES YOU ON THIS EXCELLENT EQUIPMENT.

R R WAESCHE VICE ADMIRAL USCG COMMANDANT
US COAST GUARD. /

*845A

JUN 4



THE COMPANY WILL APPRECIATE SUGGESTIONS FROM OUR PATRONS CONCERNING ITS SERVICE



Today's Best Buy - U.S. War Bonds



**GENERAL ELECTRIC
X-RAY CORPORATION**

2012 JACKSON BLVD.

CHICAGO, ILL. U. S. A.

CAUSALGIC STATES FOLLOWING INJURIES TO THE EXTREMITIES *

GEZA DE TAKATS, M.D.

CHICAGO

Physical therapy is frequently called on to treat the sequelae of injuries, such as atrophic muscles, stiff joints, shortened tendons and thrombosed or constricted blood vessels. The usual methods of heat, massage and exercise all improve circulation to the injured extremity, increase function and relieve pain. There exists, however, a group of cases in which the usual forms of physical therapy aggravate pain and increase disability. It is the purpose of this paper to describe this group of cases, the knowledge of which would seem essential to specialists in physical therapy.

Such cases, especially the mild, abortive forms, are far more frequent than any of us would have supposed. In recent studies, Miller and I¹ reported on 36 patients, and their number is steadily growing, since one's attention is more closely focused on them. A variety of names have been employed to designate the same syndrome, such as traumatic edema, acute bone atrophy, Sudeck's atrophy, post-traumatic osteoporosis, peripheral trophoneurosis, minor causalgia and reflex dystrophy. Reflex dystrophy, or post-traumatic dystrophy, has been the term used by us, although we do not feel that this label is any better than the rest of them. Since the word "causalgia" became popular in World War I, and since the syndrome is again appearing in some of the military hospitals, causalgic state seems to be a useful term for the syndrome under discussion.

The causalgic state begins very early, a few hours or days after an injury. The injury is usually mild, and occurs around the wrist, ankle or small joints of the hand or foot, where masses of muscle are absent and where nerves are abundant and superficial. Severe trauma, causing fracture of long bones and total transection of nerves and blood vessels, does not seem to be followed by this syndrome. Sprains, contusions, mild frostbites or burns, partial injuries to nerves and venous thromboses are in the history of the patients.

Severe, persistent pain of a burning character with paroxysmal aggravations is presented by the patient, whose injured limb is properly immobilized, noninfected and seemingly on the way to normal repair. In this early, first stage the extremity is warm, the subcutaneous tissue and especially the periarticular spaces are edematous and the muscles are hypertonic in their effort to splint the painful joint. The pain is closely limited to the site of injury, and its spreading character is not evident. One might call this a traumatic arthritis except that the syndrome seldom stops at this point, since it is either unrecognized or mistreated.

In a second stage the extremity is not as warm and flushed, but may become hard, cyanotic and cold to the touch. Strips of warm dry skin, corresponding surprisingly well with sensory distribution, are surrounded by a marginal hyperhydrosis. Because of the splinting action of the muscles and because of the synovial edema, the joints become stiff. The pain has now spread proximally toward the root of the limb and is aggravated by extremes of temperature, by sudden motions or by jarring. A spotty bone atrophy becomes evident.

Finally the skin becomes atrophic, the joints are stiff, the muscles are atrophic and a diffuse osteoporosis appears in the films. The pain has become

* From the Department of Surgery, University of Illinois, The St. Luke's and Research and Educational Hospitals, Chicago.

* Read at the Twenty-second Annual Session of the American Congress of Physical Therapy, Chicago, September 8, 1943.

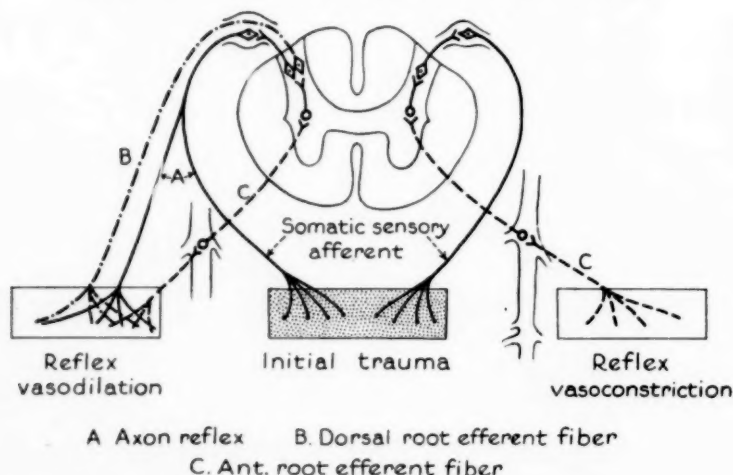
more severe. It may have spread to the trunk. It is almost intractable to any type of treatment. The patient is anxious, worried; the element of compensation neurosis frequently complicates the picture. The injured part has lost its function.

Nature of the Vasomotor Disturbance

Much speculation has arisen in the past regarding the nature of this phenomenon. Our blood flow studies revealed that the great majority of patients, especially in the early stages, exhibited an increase in blood flow, which averaged 30 per cent in 12 thoroughly studied cases. The determinations were made with an especially constructed water plethysmograph. Since the temperature of the water bath could be readily varied, one could demonstrate that warmth increased the difference between the two extremities, whereas a cold bath, of 17 C., would often minimize it. Clinically it has been known that patients frequently seek a cold moist environment for their causalgic extremities, whereas they resist or complain bitterly if their injured arms or legs are heated. One would expect such reactions in the presence of a chronic vasodilatation. In the later stages, however, there is a simultaneous vasoconstriction in the limbs which may be masked by vasodilatation. The patients, months after the original injury, may welcome heat in any form.

As early as 1924, Albert² showed for the dog that all trauma results in vasomotor reactions, which are predominantly vasodilator. In relation to our present problem, the vasodilator reflexes first predominate but may later give way to vasoconstriction. The vasomotor reflexes were summarized in our first publication.^{1a} Trauma in the broad sense of the word may consist of mechanical, chemical or thermal injuries. The initial trauma sets up three types of reflexes, as shown in the accompanying illustration. Reflex A, the axon reflex, never

VASOMOTOR REFLEXES OF THE EXTREMITIES



reaches the cord. It originates as a sensory stimulus and becomes an efferent vasodilator impulse, which is mediated through posterior root efferent fibers. Evidence for the existence of such fibers was marshalled in a previous communication.^{1c} Reflex B is mediated through the spinal cord, a sensory afferent and a posterior root efferent stimulus. This reflex can be readily demonstrated in the dog,³ but whether it is really active in man is still debatable. Finally, C is the sensory-sympathetic reflex arc, which is so obvious in acute arterial and venous occlusions and which results in the important reflex vasoconstriction in peripheral vascular disease.⁴

Whether the dilator impulses set up by trauma actually come from the spinal cord or whether they are short axon reflexes is immaterial for our present discussion. The fact is that a stimulation of nerve fibers belonging to the posterior root system is capable of producing painful vasodilatation. This is accomplished by the production of vasodilator substances at the nerve endings. This diffusible humoral substance secreted by posterior root efferent fibers has been shown to be acetylcholine. On the other hand, the hypothesis of Thomas Lewis, that all injury releases substances close to or identical with histamine, seems to be in conflict with these findings. In a recent important communication, however, Sir Thomas Lewis⁵ presented persuasive evidence that the two theories are not incompatible. In studying a case of urticaria, he found that a general skin eruption could be produced not only by heat, freezing, pressure and the faradic current, but also by pilocarpine or acetylcholine. He favors the existence of special posterior root fibers, which are cholinergic (i. e., they secrete choline-like substances), but he also believes that these substances, like any other trauma, liberate histamine-like bodies, which are then responsible for the whealing and the flare.

It is significant that in typical cases causalgia can be aggravated by prostigmine or mecholyl, which stimulate cholinergic fibers. In fact, we have used prostigmine as an early diagnostic test for causalgic states. When 1 cc. of 1:2,000 prostigmine solution is administered subcutaneously to a patient suffering from causalgia, the limb becomes warmer, the oscillations become much more pronounced and the pain is increased.^{1c} In the control limb, the oscillogram may also show some increase in pulsations but not to the same extent; nor is there any pain from this or repeated doses.

The vasodilatation resulting from prostigmine (or mecholyl) and the one seen in causalgia (Sudeck's atrophy) are very similar if not identical. If one examines a number of oscillograms obtained after the use of various vasodilators, such as heat, alcohol, nitrites or sympathetic block, one will find that the cholinergic vasodilatation produces increased pulsations together with an increased peripheral resistance. Expressed differently, venacapillary pressure is high in spite of arteriolar dilatation. There are increased pulsations, there is increased warmth; but capillary pressure and resistance seem high. The pain of causalgia can be abolished by any method which will lower the increased capillary pressure, and which will abolish the capillary barrage.

The Diagnosis

When causalgia is recognized, immediate systematic treatment must be started. If there is evidence of a partial nerve injury of a major trunk, such as the median or sciatic nerves, repeated injections into these nerves, distal to the injury, of procaine hydrochloride solution frequently stops the syndrome. The fact that these distal injections help is additional proof in favor of efferent vasodilators. Often smaller branches are contused or overstretched. The dorsal interosseous branch of the radial nerve is not infrequently damaged in injuries around the wrist, whereas ankle sprains stretch or contuse the saphenous nerve. It must be emphasized that in these nerve injuries sensory loss, or hyperesthesia, is indefinite or may be completely lacking; furthermore, it is purely subjective. I have relied on lack of sweating and increased skin temperature, which correspond closely to the sensory distribution of the same nerve. If one is in possession of an apparatus for measuring skin resistance, such nerve injuries can be readily mapped out by the heightened resistance.⁶ For practical purposes, however, the palpation of a warm dry area surrounded by cold damp margins is sufficient. This is very definite in a warm room, but if the environment is cool, a hot drink with 15 grains of acetylsalicylic acid will bring it out more definitely.

The oscillometric index is usually higher on the affected side; venous congestion aggravates, and arterial constriction alleviates, the pain. A block of the regional sympathetics, done in the early stages, promptly stops the pain; the symptoms may be relieved for several days and can again be aborted by a second injection, this time for a longer period.

The diagnosis is made then (1) by the history of an injury around the wrist or ankle or distal to them followed shortly by burning pain out of proportion to the severity of the injury (as will be discussed later, the word "injury" is to be used in the broadest sense of the word, including chemical, thermal injuries and also certain periarticular infections); (2) by a spreading neuralgia, accompanied by throbbing, painful vasodilatation, which can be relieved by application of cold, by elevation, by suprasystolic compression or by sympathetic block, and (3) by evidence of increased blood flow, as demonstrated by a rise in temperature, increased oscillometric curves or, if apparatus is available, by plethysmographic methods.

It is more and more obvious that if evidence of partial nerve injury is looked for, it will be frequently found and readily demonstrated by strips of nonsweating skin with elevated skin temperature.

Treatment

If the working hypothesis is accepted that the syndrome is a result of the irritation of posterior root dilators secreting a diffusible chemical substance, treatment must be directed against further aggravation of this mechanism. Invariably patients come to my service after weeks or months of useless or even harmful physical therapy. Heat, massage and diathermy definitely aggravate the syndrome, especially in the early stages. Proper immobilization, splinting and suitable nerve blocks at the periphery or to the sympathetic ganglions relieve the pain quite readily. It is a curious fact that one injection of procaine hydrochloride may stop the pain for several days or weeks. It is likely that the posterior root efferents, which are unmyelinated, are sensitive to local anesthetics and that once the painful stimulus is broken, the pain substance will not accumulate in a high enough concentration to produce causalgia. It also seems clearly established that acetylcholine, when secreted at nerve endings, is rapidly destroyed in a neutral or alkaline medium, whereas in an acid medium it tends to remain active.⁷ By blocking the sympathetics we provide such an alkaline medium and thus help to neutralize the pain substance. Sympathetic block also does something else. It decreases the terminal resistance, shunts the blood away from the capillaries through the small arteriovenous shunts, which are so numerous in the hand and foot, and thus abolishes the throbbing, vascular pain. By repetition of the nerve blocks at intervals this irritable efferent nerve plexus is calmed down, and the role of physical therapy becomes more prominent.

We have combined the block of the sympathetic ganglions with active motion, preferably under water. The temperature of the water should be around 70 F., which the patients seem to tolerate better than extremes of temperature. A few of our patients have constructed whirlpool baths in their homes and derived great relief from their use. When patients are treated in the late stages, with periarticular adhesion and shortened, atrophic muscles, but with little evidence of vasodilatation, the sympathetic block can be combined with more vigorous active and passive motion, much of which could not be carried out without the nerve block. The protective muscle spasm is conveniently absent during the block, and care must be exercised not to overstretch the relaxed structures.

Comment

It may seem strange to introduce such a rather infrequent and debatable subject for discussion. But the principles emphasized here have a much wider

application. In the first place, every recent injury is accompanied by such phenomena, except that they do not persist or are overshadowed by other, more obvious injuries to bone, muscle or tendons. It has also been my experience that injuries or infections around joints are often accompanied by such phenomena. Rheumatoid arthritis of the hand, with its periarticular swelling, diffuse edema, osteoporosis and extreme sensitivity to active or passive physical therapy, is one example. The severe quadriceps atrophy following internal derangement of the knee joint, which is certainly not due to inactivity, is accompanied by increased heat production and occasionally a typical Sudeck's atrophy. The sprained ankle, with plenty of opportunity for damage to periarticular nerve fibers, gives a not dissimilar picture at times. Frostbites and burns may show in their late sequelae identical phenomena. The immersion limb of shipwrecked sailors shows such a tremendous vasodilatation after the vasoconstrictive phase that nothing but ice packs will relieve the pain.⁸ The painful vasodilatation in alcoholic polyneuritis and erythromelalgia of the aged suffering from spinal arteriosclerosis are based on the same mechanism.

For men trained in orthodox neurology, it may be difficult to accept a concept that along with sensory, afferent fibers another set of nerves exist in the posterior root system, which carry impulses to the periphery and which secrete painful, vasodilating substances. The glovelike or stocking-shaped types of anesthesia, which the neurologist would call hysterical, are often the result of such diffusible, chemical substances. The differentiation of causalgic states from hysteria and anxiety neurosis has been discussed elsewhere;^{1a} suffice it to say that a demonstration of increased blood flow is our best criterion for the existence of causalgia.

Summary

Attention has been called to a vasodilator mechanism which exists as a result of the stimulation of posterior root efferent fibers. This system may become irritated after comparatively mild injuries around the smaller, less protected joints and after frostbites, burns or low grade chronic infections. The usual methods of physical therapy, such as the use of heat, massage and passive exercises, invariably aggravate the syndrome. Initial rest, relief of pain by nerve block and cautious cool baths followed later by more vigorous physical therapy under the protection of nerve block are recommended for treatment. In the late stages the condition is intractable, and even root section or cordotomy may not help it.

Reference

1. (a) Miller, D. S., and de Takats, G.: Post-Traumatic Dystrophy of the Extremities; Sudeck's Atrophy, *Surg. Gynec. & Obst.* **75**:558 (Nov.) 1942; (b) de Takats, G., and Miller, D. S.: Post-Traumatic Dystrophy of the Extremities; A Chronic Vasodilator Mechanism, *Arch. Surg.* **46**:469 (April) 1943; (c) de Takats, G.: Nature of Chronic Vasodilatation in Causalgic States, *Arch. Neur. & Psychiat.* **50**:318 (Sept.) 1943.
2. Albert, F.: Étude expérimentale des troubles vasomoteurs réflexes d'origine traumatique, *Arch. Internat. de Physiol.* **22**:391, 1924.
3. Toennies, J. F.: Reflex Discharge From the Spinal Cord Over Dorsal Roots, *J. Neurophysiol.* **1**:378 (July) 1938.
4. Ochsner, A., and De Bakey, M.: The Rational Consideration of Peripheral Vascular Disease, *J. A. M. A.* **112**:230 (Jan. 21) 1939.
5. Lewis, Th.: Observations Upon the Vascular Axon Reflex in Human Skin as Exhibited by a Case of Urticaria, with Remarks Upon the Nocifensor Nerve Hypothesis, *Clin. Sc.* **4**:365 (Dec.) 1942.
6. Richter, C. P., and Katz, D. T.: Peripheral Nerve Injuries Determined by the Electrical Skin-Resistance Method, *J. A. M. A.* **122**:648 (July 3) 1943.
7. Gesell, R.; Brassfield, L. R., and Hamilton, H. A.: An Acid Neurohumoral Mechanism of Nerve-Cell Activation, *Am. J. Physiol.* **136**:604 (June) 1942.
8. Webster, D. R.; Woolhouse, F. M., and Johnston, J. L.: Immersion Foot, *J. Bone & Joint Surg.* **24**:785 (Oct.) 1942.

Discussion

Dr. Earl C. Elkins (Rochester, Minn.): Dr. de Takats has given us a most interesting and illuminating discussion concerning a condition or conditions about which there seem to be considerable confusion and lack of knowledge. These states are apparently much more common in minor forms than is usually supposed. They may become even more common now that the incidence of trauma is increasing.

The symptoms of causalgic states described by Dr. de Takats do not differ greatly from the symptoms of the causalgia described by Weir Mitchell about 1864, except that osteoporosis was not described or noted. The term "causalgia" is a broad term, and no one would question that many phenomena—neurologic, vascular or both—enter into the cause and result of these conditions. The neurologists have apparently not improved on the description or the treatment of so-called causalgia *per se* since Mitchell gave his classic description of the condition.

I feel entirely incompetent to discuss this paper because of my lack of experience with the treatment of these conditions and because of my limited knowledge of what is known concerning their pathologic physiology.

However, all of us probably have had some experience in the treatment of conditions that appear to have presented the vascular phenomena described by Dr. de Takats regardless of their name or their primary cause. Likewise, any one who practices physical medicine will have experienced discouraging results obtained by use of the frequently requested heat, massage and exercise in a certain number of cases. I think that many of us have questioned the efficiency of heat and massage in certain conditions in which vascular phenomena already present appear to be similar to those produced by heat. We may wonder whether we should constantly lean toward the use of heat and other stimulators of vasodilatation, expecting them to accomplish effects far beyond the scope of their possible reactions.

Since it has been rather well proved that certain neurovascular responses due to trauma and other conditions, resulting at least in part in responses similar to those produced by physical vasodilators, heat and massage, we perhaps should use more extensively physical vasoconstrictors, such as cold. It should or could be used over longer periods and more constantly in the early stages of these causalgic states when vasodilation is evident. Or it could be used in conjunction with the various nerve blocks if the cold used alone increased the sensory disturbance.

I should like to know whether Dr. de Takats has had any experience with the mild forms of refrigeration in such conditions, that is, the use of cold of sufficient intensity to cause anesthesia and vascular constriction. Would it be logical to use cold during the hyperemic stage either alone or in conjunction with sedatives or nerve

block, particularly extremes of cold which would produce anesthesia and might reduce sensory impulses as well as act as a vasoconstrictor.

There are workers who describe acute bone atrophy or Sudeck's atrophy as being a Raynaud phenomena. If this is so, at least in certain stages of the disease, is it not possible that both the physical vasoconstrictors and the physical vasodilators should be used, according to the stage of the disease? Is it not true that with arteriolar dilation there is capillary constriction, and does not this occur in these causalgic states? If this is true at least in certain stages, might we not work on the hypothesis that certain capillary dilation which would not increase the sensory disturbances, such as mecholyl ion transfer, is indicated in certain instances?

I mention this because, recently, Dr. Hoberman, who has been studying with Dr. Krusen, reported that in several cases of Sudeck's atrophy he had treated the patient with mecholyl ion transfer, the contention being that this could be used without increasing the sensory disturbances. Dr. Hoberman gave these treatments on the basis of: (1) the observation of Miller and de Takats that coexistent arteriolar vasodilatation and capillary vasoconstriction have been noted in a number of cases; (2) Lerich's dictum that vasoconstriction can and will produce pain; (3) attempts to relieve vasoconstriction by the usual physical means, such as radiant heat, hot or cold baths, massage and exercise, fail because of extensive stimulation of touch in temperature stimulation.

I realize that this last suggestion is entirely paradoxical to what has been said already by Dr. de Takats in regard to vasodilatation resulting from prostigmine or mecholyl, that is, that the vasodilation resulting is "very similar, if not identical, to that seen in causalgia." However, there is a time during the progress of the disease in which vasodilators may be used if there is capillary constriction. I think we should reemphasize Dr. de Takats' contention that undoubtedly too many patients are sent to the physical therapist with the hope that something may be done for them, and undoubtedly we frequently increase the symptoms or at least are of no assistance in treatment of the condition. Also, it is possible that in some instances of trauma we are too anxious to use vasodilators, such as heat, instead of cold. In later stages of the disease, or in the stages of improvement, it seems to be the consensus that the various types of physical therapy, particularly encouragement to use the part, play an extremely important role in the conservative treatment of these conditions.

I should like to say in closing that we are greatly indebted to Dr. de Takats and his colleagues for their painstaking work in conducting these studies.

Dr. G. de Takats (closing): I should like to thank Dr. Elkins for his excellent discussion. He brought up a number of

(Continued on page 680)

PHYSICAL TREATMENT OF DISABILITIES OF THE FOOT COMMONLY ENCOUNTERED IN MILITARY SERVICE *

CAPTAIN THOMAS E. DREDGE

Medical Corps

Army of the United States

Disabilities of the foot occupy a considerable part of every medical officer's time. The types of disabilities of the foot encountered in the Army will vary somewhat from those encountered in civilian practice, owing largely to two factors: (1) the limited age group and (2) the elimination by the draft boards of a large number of men with severe conditions of the foot, including marked congenital abnormalities. However, in spite of selection a considerable number of men suffering from disabling conditions of the feet have been inadvertently inducted into service. Then too there is a group of conditions which are peculiar to the military service, such as trench foot, frostbite, march foot and immersion foot. There is also an increase of trichophytosis of the feet. Because the subject is a broad one, trichophytosis will be mentioned but not discussed.

Disabilities of the foot in the Army fall largely into four groups: (1) traumatic, which includes fractures, dislocation and sprains; (2) mechanical static, which includes flatfoot, metatarsal depression, pes cavus, hammer toe, hallux rigidus and hallux valgus; (3) occupational—trench foot, frostbite, march foot and immersion foot, and (4) dermatologic conditions, including trichophytosis.

In order to render proper care to the foot the medical officer must have at least a basic knowledge of the anatomy, physiology and mechanics of the foot and ankle. A brief review follows:

The functions of the foot and ankle are weight bearing and flexible locomotion.¹ Functional disturbances involve mechanical stress and strain on muscles, ligaments, capsules, bones and joints. Two bones of great importance are the astragalus and the os calcis. The astragalus is of importance especially because it is the mortise bone between the leg and the foot.

The bones of the foot form two longitudinal groups, a medial and a lateral. The medial group, which receives most of the thrust of the body weight through the tibia, consists of the astragalus, scaphoid, three cuneiforms, three medial metatarsal bones and three medial toe phalanges. The lateral group is composed of the calcaneus, cuboid and the lateral two metatarsal bones and their phalanges.

The talocalcaneal and the talonavicular are the only joints in the foot in which considerable movement takes place. The subastragalar joint is a large articular region between the talus above and the calcaneus and navicular below and in front. The talonavicular segment of this articulation is of the ball and socket variety. The lower part of the head of the talus articulates with the spring ligament (plantar-calcaneonavicular), the latter being important in maintaining the longitudinal arch. The midtarsal joint is supported by the long and short plantar ligaments, which separate the posterior and anterior parts of the foot.

The longitudinal arch is made up of medial and lateral columns. The

* This work was done by Captain Dredge as a student officer under direction of Dr. F. H. Krusen, while he was on assignment at the Mayo Foundation for instruction in physical medicine.

transverse arch is wedge shaped because of the contour of some of its bones, namely, the middle and lateral cuneiforms and the second, third and fourth metatarsals. When it gives way the metatarsal heads are lowered, causing pain, and in some cases the formation of calluses (Callender's Anatomy).

Before some of the more common conditions of the foot are discussed, a few comments are in order. While the soldier may complain of disability of the foot, one must not assume that this is always his real trouble. For example, he may be a psychoneurotic person, whose complaint of disability of the foot is therefore exaggerated as a flight mechanism from reality, or he may be malingering. It is also noted that foot complaints increase when the morale of an organization is low and conversely decrease with elevation of morale. They may also be the result of some systemic or neurologic disorder. Having determined that the condition is chiefly confined to the feet, the medical officer can then go forward with treatment indicated.

Sprains

Sprains are common. They are usually produced by a twist or during jumping or falling, as after a parachute jump.² The immediate treatment consists in the reduction of active and passive congestion by the application of a firm support, cold and elevation of the foot. Cold applications are indicated up to forty-eight hours after the injury has been sustained, as local vasoconstriction is desired to lessen extravasation into the tissues about the site of the injury.

Some surgeons are now injecting 1 per cent solution of procaine hydrochloride at the site of injury and claim good results. The patient is instructed to use his foot. This procedure does give relief, but it is perhaps of questionable value when a severe injury has been incurred, and it seems unwise to use this procedure except in an emergency situation. Good results have been reported with diathermy. Heat and massage are useful in cases in which there have been effusion and much swelling. Prolonged physical therapy following sprains is usually not necessary if early weight bearing is made possible by proper fixation.

Delpat³ described a useful method for strapping the sprained ankle: "Almost invariably the ligament injured is the external lateral ligament of the ankle extending from the lower end of the fibula to the astragalus and calcaneus. Sprain of this ligament results in swelling, discoloration and if improperly treated results in a weak ankle." A 2 inch (5 cm.) strip of adhesive tape of sufficient length is applied, commencing just below the internal malleolus, is placed across the sole of the foot and is held in close apposition to the head of the fibula. At the same time, the ankle is held flexed to a right angle and with as much eversion of the foot as is possible. The adhesive tape is then applied to the side of the leg under tension and held by the patient's fingers at the head of the fibula. A second strip of adhesive tape is then applied, holding the adhesive tape in apposition to the leg in the region of the external malleolus. This strip does not circle the leg, but leaves a space 1 inch (2.5 cm.) wide or more over the achilles tendon. Further strips of adhesive tape are applied, surrounding the foot from the folds at the toes up to the first circular strip. All these strips leave a space, however, along the sole of the foot, and none of them overlap or press on the achilles tendon. A circular bandage is then applied over the adhesive tape. The patient returns to duty.

Fractures

Fractures of the ankle and bones of the foot are common. They present

two aspects: a medical aspect, which includes the recognition, reduction and immobilization of the fracture, and a military aspect, which includes the length of time consumed in recovery, as measured by the period over which the soldier is unable to perform his duties, and the final result, measured by permanent residual disability. From a military standpoint the effectiveness of treatment of fractures, then, cannot be based solely on securing union of the fractured bone or bones, for the rapidity with which the soldier returns to duty and the extent to which function has been restored must also be taken into consideration. Formerly⁴ treatment consisted in applying a splint and leaving it to nature to complete the cure. Properly applied physical therapy will considerably shorten the period of disability. Briefly stated, the purpose is (1) to promote early absorption of hemorrhage and traumatic exudate, (2) to relax muscle spasm in order to relieve pain and discomforts, (3) to reestablish normal circulatory conditions in the affected extremity, blood stream and lymphatics, which insures a more rapid and complete healing of the fracture, and (4) to build up in the muscle of the extremity the tone and flexibility so necessary to normal use. To this end four basic forms of physical therapy may be used. They are heat, massage, exercise and muscle stimulation.

March Foot

March foot¹ occurs in the shafts of the metatarsals. It develops insidiously with slowly increasing pain, which at first arises after prolonged excessive effort, later after ordinary exercise, and ultimately becomes continuous and incapacitating. Frequently the swelling of the anterior part of the foot is associated with an insidious spontaneous fracture of one of the metatarsal bones. According to Speed and Blake⁵ the condition has been recognized for many years by foreign military surgeons who encountered it among their troops. After a long march pain is felt in the anterior part of the foot, and tenderness over the anterior portion of the second and third metatarsal bones. The disability increases, and after a few days a swelling is noted on the anterior part of the foot. Dodd⁶ expressed the belief that march foot occurs in architecturally weak feet. Most commonly affected are the second and third metatarsals. The roentgenogram of the metatarsal bones reveals a linear fracture. If the roentgenogram is taken shortly after the onset of symptoms, only swelling of the soft tissues is noted. After one to three weeks a little periosteal fuzziness is noted at the site of the beginning fracture. Excessive formation of callus and solid union occur in about six months and the excessive callus is absorbed.

The treatment consists of rest, hot applications and relief from weight bearing. This may restore the foot to normal in a week or ten days. Toe exercises to restore flexibility of the anterior metatarsal arch and a proper arch support or strapping of the foot should be employed when walking is resumed. The average disability is from four to eight weeks.

Flatfoot

Flatfoot,⁷ or pes valgoplanus, is a structural deformity which may arise from several causes. This deformity may be congenital or acquired. The acquired form may develop as a result of functional decompensation of the foot, so-called static pes valgoplanus, as the result of trauma or secondarily to paralysis.

Static pes valgoplanus is the most common of all ailments of the foot. It occurs early in childhood and during adolescence, but is most frequently present in adult life. In its prodromal stage it is described as a "weak foot." This is an acutely painful condition without deformity and is a result of a

functional decompensation. When an acute strain arises in the presence of pes valgoplanus, reflex muscle spasm will occur and the condition known clinically as spasmodic pes valgoplanus is present. If this has been present for many years, the alterations are such that the foot has a tendency to become fixed, and a condition arises which is called "rigid pes valgoplanus."

Congenital Deformities of the Foot

Congenital deformities,⁷ or abnormalities of the bones of the foot, such as a short first metatarsal and an accessory scaphoid, are in reality a throw-back to the arboreal foot, as has been demonstrated by Morton.⁸ Their effect is to decrease the stability of the anterior pillar of the inner longitudinal arch of the foot and so permit unrolling, or pronation, of the foot and eventual descent of the longitudinal arch.

Hallux Valgus

Acquired deformities of the foot, such as hallux valgus, cause disturbances of the architecture of the foot, and fractures of the foot bones and loss of a toe or toes or other parts of the foot do the same. Hallux valgus, by depriving the medial side of the foot of the supporting action of the great toe, allows the foot to roll in, or pronate, and favors the descent of the longitudinal arch. Fractures of the bones of the foot, particularly of the os calcis, frequently result in depression of the longitudinal arch, through changes brought about in the relations of the bones of the foot to one another.

Short Heel Cord

A short heel tendon produces deformity stresses within the adult foot just as it does the growing and adolescent foot. It does not permit complete dorsiflexion and thus throws the burden of weight bearing chiefly on the anterior part of the foot. In walking, this concentration of weight on the forepart of the foot causes downward and inward displacement of the subastragalar joint and in time descent of the longitudinal arch. The pull which a short heel cord exerts on the os calcis tends to roll it inward and tilt the subastragalar joint downward and inward to depress the longitudinal arch of the foot.

Weakness or deficiency of the muscles of the leg and foot may be true muscular weakness due to severe illness or actual muscle paralysis. Muscle deficiency may be relative, that is, due not to actual weakness of the muscles but to the fact that they are incapable of performing the work required of them when the body weight is excessive. Weakness of the muscles causes flatfoot through their inability to maintain the leg in an approximately vertical plane over the foot.

Improper Footwear

Wearing of high heeled shoes, short shoes or any other shoe which cramps the foot throws it out of balance. Under these conditions any weakness present is accentuated and even a relatively good foot will break down.

Symptoms of Abnormal Conditions of Foot

The chief symptoms of abnormal conditions of the foot are pain, limitation of motion, fatigue, deformity, areas of tenderness and limping. A common symptom is stiffness and pain when activities are resumed after a period of rest. The pain in the beginning is perhaps better described by the term "discomfort." A tired feeling in the longitudinal arch and calves

of the legs is often the first indication of foot strain. If unrelieved by proper therapy, in the course of time the pain may increase and become disabling. It is usually localized in the region of the astragalus or scaphoid bone and the subastragalar joint but may include the entire foot. Cramping pain in the back of the leg and even back pain may be present.

As has been previously stated, the complaint of painful feet is one of the most common things to be noted by the Army surgeon. Soldiers who are not yet well hardened into the Army environment are especially prone to complain that their feet hurt so much they cannot carry on the rigorous marching that is demanded of them.

Three⁹ general groups of soldiers who complain of pain in their feet are noted:

1. Soldiers of the first group are suffering from several deformities of the foot, such as fracture deformities or marked pes planus. The only procedure to be followed with these soldiers is early separation from service. A few who have special qualifications may be retained on a limited duty status.

2. Soldiers of the second group are those not used to arduous marching. Many have a mild depression of the longitudinal or transverse arch. Time aided by appropriate measures will relieve many of these men.

3. Soldiers of the third group are malingerers. These may be spotted by exaggeration of symptoms, lack of organic changes in the foot and no response with rest. Fortunately this last group is relatively small.

Treatment of Conditions of the Foot

The Army surgeon⁹ cannot tell in every case by examination alone which feet will respond to therapy. The value of therapeutic trial will become evident after one sees the response that some soldiers make to felt foot supports.

Adequate fitting of shoes is of acknowledged importance. A change of shoes may be all that is necessary to relieve the soldier who complains of pain the longitudinal arch. New shoes may aid not only by eliminating the abnormal position of a cramped foot but also by redistributing the weight of the foot to new areas on the sole of the foot, away from old tender pressure points. If a patient complains of pain in the longitudinal arch with only slight depression thereof, a piece of steel riveted to the shank of the shoe will often relieve the condition. A piece of felt placed inside the shoe over the heel will relieve many who have painful calcaneal bursae. An anterior tarsal bursa may be relieved by insertion of a thin piece of felt just under the tongue of the shoe. In many cases, a felt pad strapped on the foot with adhesive tape will be found useful. If pain is confined to the longitudinal arch the felt is cut to conform to the shape of this arch and is fastened by adhesive tape. For metatarsalgia the pad is cut in the shape of a triangle and is placed just posterior to the metatarsal heads. Restrapping with fresh pads may be performed in three to five days.

Manipulation¹⁰ of rigid feet may be done with discretion. This is followed by skilful massage and active and passive movements until the injury has resolved. When necessary, reeducation in muscular control must be given to correct any postural deformity or other error in function in order to prevent recurrence of the strain.

Operative procedures may be employed on hallux valgus, hallux rigidus and sometimes pes cavus. The results may be satisfactory for civilian pursuits but are not sufficient for military activities, especially with hallux rigidus and pes cavus.

The physical therapy⁴ commonly used in foot disabilities consists of:

1. Rest
2. Exercise (a) active } with or without weight bearing
 (b) passive }
3. Massage (c) local, general — postural
- (a) with rest and exercise
 to improve circulation
4. Heat (a) radiant
- (b) conducted (dry or moist) — foot bath
- (c) diathermy
5. Other forms (a) galvanic and faradic stimulation
- (b) roentgen therapy
- (c) iontophoresis (in mycotic infections)

Trench Foot and Frostbite

Trench foot is a lesion which was noted during the war of 1914-1918 among soldiers in the trenches. It is the result of exposure to cold with dampness and constriction by footwear, puttees and leggings. It causes intense pain, discoloration and finally gangrene. The pathologic changes are in the nature of angioneurosis in the pregangrenous stage. Sweet, Norris and Wilmer¹¹ stated that trench foot starts from the interior and that the infections which often mark the course of the disease are the secondary manifestation of devitalized tissue to infective agents. The symptoms are burning pain and hyperesthesia. The skin is red and beefy. Potassium iodide therapy is reported to give good results. As prophylactic treatment, men should be relieved from duty in the trenches frequently. Shoes and puttees should be loosened before the soldier enters the trenches. The feet should be oiled with grease or whale oil, which should be rubbed in. Dry socks and dry shoes should be worn. In mild cases, warm foot baths should be used daily. The foot should be massaged gently twice a day when edema is present.

Neglect to consider the possibility of incapacity of great numbers of troops from frostbite and its kindred ill, trench foot, may result in sufficiently high morbidity to cause loss of a critical campaign. In the Gallipoli campaign, there were 15,900 cases in November, 1915. During the present war undoubtedly large numbers of cases of these conditions are occurring in the Russian theatre.

During the present war another syndrome has been recognized and studied, namely, "immersion foot," seen among shipwrecked men who have been forced to spend long periods in the water on half waterlogged boats.

Aggravating factors of frostbite and trench feet are dampness, circulatory stagnation, wind, anoxia, malnutrition and trauma. A frostbitten hand should be carried in a sling or similarly held against the body for protection. Footwear should be loose. Foot drill centers should be established. In these centers men sit in pairs facing each other. Each man removes his companion's boots and socks, and if water is available his feet are washed and carefully dried. Each man then carefully rubs his companion's feet by gentle massage with oil until it has disappeared. Dry, clean socks are then put on.

Four degrees of frostbite may be noted: (1) first degree, a white patch of frostbite involving the outer layers of the skin without blistering or peeling; (2) second degree, damage of the superficial layers of the skin severe enough to produce blistering or peeling but not severe enough to damage the deep layers of the skin or subcutaneous tissues; (3) third degree, sufficient damage to produce death of thick layers of skin and subcutaneous tissues, and (4) fourth degree, gangrene which may lead to loss of an extremity.

Mechanism of Pernio or Frostbite. — On first exposure to cold a direct local vasoconstriction takes place in the superficial vessels, which persists. The second step is an immediate general vasoconstriction by reflex action through the central nervous system. Third, the cold venous blood returning from the cooled skin joins the blood in the general circulation and lowers its temperature, resulting in persistent general vasoconstriction.

A recognition of the first signs and symptoms, with prompt care, will avert most of the serious after-effects. The involved skin assumes a dull yellow pallor. When the skin is frozen without involvement of the deeper subcutaneous tissues there is a sensation of a movable plaque or coin buried in the skin. With freezing, tissues become solid and are immovable. If freezing continues, there is destruction of structural tissue, including walls of blood vessels, and edema and hemorrhage may develop. Thawing is the period of greatest danger. The sudden production of edema, often with pressure, during the thawing period is responsible for a great degree of the serious damage, owing to splitting and separation of the intracellular and intercellular tissue substances. Trench foot is almost identical with a mild frostbite. In the presence of dampness, the pathologic changes take place at a much higher level of temperature than would otherwise be the case, owing partly to the fact that water is a better conductor of heat than air.

Immersion Foot

Immersion foot is a condition produced by prolonged immersion of the feet in water. In the cases so far reported the immersion has been in sea water, usually associated with immobility of the legs and constriction of the legs by boots and clothing. Webster, Woolhouse and Johnston¹² have recently reported 142 cases of the "immersion foot syndrome." They described the feet as "cold, swollen, waxy white with cyanotic areas." Subjectively the feet feel heavy, woody and numb and are anesthetic to pain, touch and temperature. After removal of the feet from exposure to the etiologic environment, they rapidly become swollen, red, hyperemic and hot without sweating. A bounding pulse develops in the dorsalis pedis and posterior tibial arteries. The most severely involved regions remain edematous, hot and cadaveric appearing. The picture is that of extreme vasodilatation with damage to the vascular walls and transudation. Intense paresthesias develop eight to ten days after rescue and may last three or four weeks. Rapid warming of tissues is dangerous, as in frostbite. Treatment for immersion foot is as follows: The feet are swabbed carefully with alcohol, and ice bags are applied around them. The feet are elevated 10 to 12 inches (25 to 30 cm.). The object of this principle of treatment is to reduce the tendency toward edema and extravasation of blood until the vasomotor tone can be reestablished.

Summary

Some of the more common disabilities of the foot and their physical treatment have been discussed. A great deal more could be said regarding these conditions, which the military surgeon will encounter in varying numbers, according to the situation. It is a common remark that "the army travels on its stomach." It is equally true that it travels on its feet, and a large part of its success will depend on proper care of the feet.

References

1. Lewin, Philip: *The Foot and Ankle: Their Injuries, Diseases, Deformities, and Disabilities*, Philadelphia, Lea & Febiger, 1940, p. 620.

(Continued on page 678)

SOME THOUGHTS ABOUT SHOCK THERAPY *

CLARENCE A. NEYMANN, M.D.

From the Cook County Psychopathic Hospital and Northwestern University Medical School

CHICAGO

The medical profession usually evaluates a new therapeutic procedure by stages. In the beginning, very little attention is paid to a new scientific discovery. Then if the first clinical reports are confirmed by many investigators a period of overenthusiasm ensues. After this we are suddenly seized by disappointment because the new therapy has not lived up to our most roseate expectations; everybody seems to enjoy voicing their complete disgust in the apparent failure of the medication because it has not performed the miracles foolishly ascribed to it. Finally, after years of dispute and argument, the true worth of the remedy is established.

The first accounts of shock therapy were published by Meduna¹ and Sakel² about eight years ago. Electric shock therapy was introduced by Cerletti and Bini³ in 1938, though convulsions in animals produced by electrical currents were described by Viale⁴ as early as 1929. Hence it is apparent that too little time has elapsed for us to evaluate these procedures, especially when we recognize the fact that they are employed in the treatment of essentially chronic mental diseases, which in reality consist of psychologic life patterns. Schizophrenias and manic-depressive psychoses are more chronic than cancerous growths or tuberculosis.

In the opinion of most psychiatrists it is impossible to judge the ultimate outcome of any psychosis in less than ten years. Sometimes it takes a lifetime to understand the inner conflicts of a patient who is suffering from a chronic mental ailment. The reports of the instantaneous results of shock therapy, and especially of electric shock therapy, are often ridiculous. Many of these glowing accounts have been published by clinicians who had no inkling of psychiatric concepts, to say nothing of their total lack of training in the field of mental and nervous diseases.

Several hundred patients have been treated by electric shock therapy in my service at the Cook County Psychopathic Hospital and at other hospitals. These have been observed for periods ranging from three years to a few weeks. If it were my desire to be rash and to make myself ridiculous, it might be stated that all were improved or cured. In order to make such a ridiculous assertion truthfully, it would only be necessary to neglect completely the number of days or in some cases hours during which the patient remained well.

A psychogenic psychosis is a state of mind seen only in man. No one has ever described a psychotic cow or a crazy fish. Both animals have too little mentality to become insane. Organic disease of the central nervous system may make an animal rabid and produce a temporary increase in psychomotor activity, but this is something entirely different from a psychogenic psychosis. The nearest approach to true insanity found in animals is the evil temper displayed by individuals of highly intelligent species. Perhaps the best example can be observed occasionally among elephants. Some elephants are known as rogues. These must be killed because they are seized with sudden, unaccountable fits of anger. At such times they kill and destroy everything and everybody within their reach.

* Read at the Twenty-second Annual Session of the American Congress of Physical Therapy, Chicago, September 10, 1943.

It is an established fact that as mentality decreases in man, just as in animal species, the tendency to become psychotic also abates. Idiots are never psychotic; imbeciles hardly ever develop a functional psychosis or a neurosis; morons are rarely afflicted by these diseases. Children below the age of puberty sometimes react to difficult family situations by a neurotic or psychotic trend. Such occurrences are so rare that they are carefully studied as interesting psychiatric phenomena.

Before the advent of true shock therapy it was beneficial on occasion to treat psychotic patients by keeping them drunk for several weeks; this frequently resulted in delirium tremens or acute alcoholic hallucinosis. The use of sedative drugs to the extent of producing continuous sleep. "Dauerschlaf," lasting two weeks or more was also advocated by some psychiatrists. Temporary improvement and so-called "cures" were reported after both procedures. After such radical and dangerous treatment a definite alleviation of some of the most objectionable symptoms has been observed by others and myself.

Some years ago Loevenhart, Lorenz and Waters⁵ partially asphyxiated chronically psychotic patients by forcing them to breathe a mixture of 85 per cent oxygen and 15 per cent carbon dioxide. During the semicomatous state which followed, old deteriorated psychotic patients gave sensible answers to questions and were aroused temporarily from their complete lethargy and absorption in their world of dreams.

Some of these patients had been ill for many years. Some were improved permanently after a series of treatments.

After the introduction of insulin and metrazol shock almost every one who faithfully followed the suggested outline of treatment agreed that certain patients were benefited. Many theories as to the physiologic and psychologic action of both drugs have been suggested. None is completely satisfactory.

Since insulin and metrazol shocks were given two or three times a week, it was but natural to follow the same procedure with electric shock therapy. In a paper about to be published in the *Journal of Nervous and Mental Diseases*, entitled "Electric Shock Therapy in the Treatment of Schizophrenia, Manic-Depressive Psychoses and Chronic Alcoholism," Neymann, Urse, Madden and Countryman have suggested a radical change in technic.

We treated our patients daily and observed that all of them soon became extremely confused. It became evident that this confusion was beneficial. The patients who were given subconvulsive shocks and those who were treated only until they seemed to have recovered from their psychosis without apparent confusion either promptly reverted to their former sick state of mind or were not benefited at all. Since then, all of our patients have been treated until they have become completely disoriented for time, place and person. At this juncture their psyche is almost nonexistent and the functions of the central nervous system are expressed at an almost purely vegetative level.

The average patient treated in this manner remains confused for one or two weeks. Then a more or less permanent retrograde amnesia follows, extending back weeks or months before the treatment was started and encompassing the entire treatment period. The patient wakes up one morning and invariably talks about as follows: "Where am I?" "How did I get here?" "What year and month is this?" "I remember nothing of my past!" "What is all this about!" At this time all patients are not psychotic and are apparently cured, at least for the moment. The only exceptions are those who have been deteriorated for so many years that their

psychosis is all that remains of their entire mental life, since all their thoughts have been chronically psychotic for many years. Such patients wake up just as sick mentally as they were before treatment. Hence it is apparent that a mental recovery cannot be expected in old deteriorated schizophrenic patients. A few may improve.

After these studies my interest in some of my former patients was stimulated and renewed. A new psychic survey of those who recovered after metrazol and insulin injections was made. To my surprise, all of them had a lapse of memory for longer or shorter periods during and before the treatment. It seems likely that the psychic rest from internal conflicts and the obliteration of some of the memories which were the direct and final cause of the psychic disintegration form one of the reasons, if not indeed the dominant reason, for the mental recovery so frequently observed after shock therapy. This theory would seem to explain why such divergent methods as the administration of alcohol, continuous sleep, and the use of mixtures of carbon dioxide and oxygen, insulin, metrazol, and electric shock sometimes lead to the same end result, a partial or complete recovery.

It explains another fact. Most patients recover from recurrent depressions with or without treatment. Manic-depressive insanity is an intermittent disease. Practically all patients with depression of the manic-depression variety recover after properly administered electric shock therapy.

This is not true of patients with schizophrenia, a chronic progressive ailment. During the last three years, 90 schizophrenic patients were treated at the Cook County Psychopathic Hospital by means of electric shock therapy. Thirty-one have returned to the community and were working productively at the time of the last survey. All the rest relapsed or, in the case of those with chronic schizophrenia, never recovered to the extent of being able to maintain themselves in the outside world. The time of observation and study since treatment is three to twenty months. It is probable that more of these patients will relapse as time passes. Nevertheless, this is a good record, since spontaneous recoveries in a similar series and time interval probably would not average more than 10 per cent.

Why then do the vast majority of patients with a depression recover while only a small percentage of those with schizophrenia reach the same goal after electric shock therapy? The answer lies in the psychologic structure of the two diseases. A depression is self limiting because the patient retains his interest in the outside world. If once he has forgotten the direct cause of his latest psychotic episode, his extrovertive mechanisms have a tendency to keep him in close touch with reality. He remains cured until his internal tensions and subconscious conflicts again overcome his better judgment. Also, he may lapse into a mild manic state which is not recognized as psychotic.

A schizophrenic patient has a personality which retires within itself whenever an active conscious or subconscious conflict is encountered. It is not possible or desirable to obliterate all the memories of the past. Most of them remain. When a person with schizophrenia recovers from the electrically induced retrograde amnesia, some of his conflicts immediately present themselves as tremendous problems. His interests are in-going from the outside world to himself. Therefore, his mental processes tend toward a return of his mental ailment. There is no basic psychic mechanism which encourages him to keep in touch with the world of reality.

If patients are treated psychotherapeutically during the interval directly after shock therapy, when they are apparently normal, the recovery rate increases. Electric shock therapy should, therefore, be followed by psycho-

therapy or psychoanalysis in selected cases. The patient is more likely to be treated as an individual in private practice than under the best routine institutional care. Consequently, the recovery rate for early schizophrenia rises to about 60 per cent when individualized psychotherapy follows electric shock treatment. Patients in this stage are inclined to become somewhat stabilized before they become fully aware of their former conscious and subconscious stresses; hence they are less likely to relapse. Their psychic difficulties have been bridged by the psychiatrist.

It is our belief that neurotic patients, with the exception of extremely recalcitrant ones, should never be treated by shock therapy. They are accessible to psychotherapy without a temporary dulling of their mentality. Shock therapy only serves to disturb a psychoneurotic patient and often produces a permanent fear of dementia because he becomes acutely aware of his retrograde amnesia, or lapse of memory.

From all this it follows that electric shock therapy should be used only by a skilled psychiatrist who has learned enough about electrical currents to appreciate their clinical significance. In order to produce a convulsion a current of approximately 600 milliamperes and 120 volts is passed through the frontal region during a time interval of from 0.3 to 1.5 seconds. Such a current may cause death if it is passed directly through the region of the heart or the respiratory center. Electric shock therapy is far from being an indifferent procedure.

Some people have imagined that there is a gap between physical and mental reactions. None of us know why or how we think. Heretofore, physicians have assumed that mental activity is an electrophysical phenomenon. The study of brain waves has confirmed this. Directly after electric shock therapy the alpha waves are flattened, and during the period of confusion they are definitely altered. After weeks or months of rest these alpha waves resume their former rhythm. In this respect electric shock therapy has demonstrated that the so-called gap between physical and mental reactions does not exist. The behavior of the patient while he is confused is reflected by a disturbance of the alpha waves.

A psychiatrist is equipped to study mental reactions. Therefore, it does not seem amiss to repeat that electric shock therapy must be supervised by a physician trained to observe mental states. If this basic principle is not accepted, a really valuable therapy will soon fall into disrepute. The indiscriminate use of any therapeutic procedure only leads to grief both for the patient and the physician. A psychiatrist must select the type of psychosis to be treated. He should always be conservative in his expectations, and he must remember that a temporary brilliant result means nothing when he is dealing with essentially chronic mental diseases, which are really patterns of mental life. While the present outlook appears brilliant, a true evaluation of electric shock therapy will require at least another ten years of study.

References

1. Meduna, L. J.: Versuche über die biologische Beeinflussung des Ablaufes der Schizophrenie; Campher- und Cardiazolkrämpfe, *Ztschr. f. d. ges. Neurol. u. Psychiat.* **152**:235, 1935.
2. Sakel, M.: Schizophreniebehandlung mittels Insulin-Hypoglykämie, *Wien. med. Wchnschr.* **84**:1211 (Nov. 3) 1934, March, 1935.
3. Cerletti, U., and Bini, L.: L'Elettroshock, *Arch. gen. di neurol., psichiat. e psicoanal.* **19**:3, 1938.
4. Viale, G.: Accesos epileptiformes en perros bajo la aplicación periférica de corriente alternada, *Rev. Soc. argent. de biol.* **5**:170 (June) 1929.
5. Loevenhart, A. S.; Lorenz, W. F., and Waters, R. N.: Cerebral Stimulation, *J. A. M. A.* **92**:880 (March 16) 1929.

THE NATURE AND CHEMICAL ACTION OF ULTRAVIOLET LIGHT

G. K. ROLLEFSON

Department of Chemistry, University of California

BERKELEY, CALIF.

The term "ultraviolet light" is applied to that portion of the spectrum extending from the limit of the visible, at approximately 4,000 angstrom units, to a somewhat indefinite junction with the roentgen ray region. The shorter wavelengths in this region are strongly absorbed even by very simple molecules. As examples, we may cite the absorption of water, which becomes high at wavelengths below 1,900 angstroms; that of quartz (SiO_2), which rises rapidly in the same region, and that of methane (CH_4), which begins at 1,800 angstroms. The fact that some photochemical studies have been carried out using the 1,850 angstrom line of mercury as emitted by the quartz mercury arc is due to the very great intensity of that line, which makes an appreciable amount of light available in spite of the absorption by the quartz which confines the arc. Furthermore, this mercury line is strongly absorbed by the oxygen in the air, so that if there is any great air path between the arc and the object which is being irradiated there is no appreciable amount of light of this wavelength available. For practical purposes the ultraviolet light which is of importance in our present discussion is limited to the region between 4,000 and 2,000 angstroms.

The most fundamental principle in photochemistry is that light in order to be effective in causing a reaction to occur must be absorbed. Let us turn, therefore, to a brief discussion of the absorption of light in the aforementioned range by various substances. The light frequencies which may be absorbed by any given molecule are determined by the differences between various pairs of the permitted energy states of that molecule. The quanti-

tative relationship is given by the Bohr frequency principle, $\nu = \frac{\Delta E}{h}$,

in which ν is the frequency of the light, ΔE the difference in energy between two states in the molecule, and h is Planck's constant. In a monatomic system the number of permitted energy states is small, and therefore the absorption spectrum consists of relatively few lines. As the complexity of the molecule increases, the number of absorption processes increases, so that we find broad bands of absorption instead of lines. The locations of the absorption bands in the spectrum depend on the magnitude of the characteristic energy differences within the molecule, and these in turn are markedly dependent on the chemical nature of the molecule. Thus the hydrocarbons of the methane series absorb only light below 2,000 angstroms, but if one CH_2 in the molecule is converted into a ketone group, or aldehyde if it is at the end of the chain, a band appears with a maximum intensity of absorption at approximately 2,800 angstroms. The fact that this band is essentially the same regardless of the number of carbon atoms in the molecule causes us to speak of this absorption as occurring in the carbonyl group. Similarly, other groups cause characteristic absorption in other regions of the spectrum. As the molecules become more complex, i. e., contain various different radicals, the positions and characteristics of these ab-

sorption bands may be modified considerably. For example, the replacement of the hydrogen atom in the aldehyde group of acetaldehyde by a halogen atom causes a considerable modification of the carbonyl absorption in these compounds. In more complex systems even greater changes are found, so that in general it is not possible to specify with certainty what group in the molecule is responsible for a given absorption. It has been possible, however, to set up empiric rules concerning the effect of various groups on the absorption of a molecule which enable the chemist to prepare a compound which will absorb in almost any desired region. In general all complex organic compounds have a strong absorption which begins somewhere between 2,500 and 2,000 angstroms in addition to any specific absorption they may have at longer wavelengths.

In order to bring about chemical changes with light in the region under discussion the photochemist has, at least in theory, numerous sources available. Use of a monochromator or a suitable combination of filters will permit the isolation of a line or group of lines from any given arc or spark source. Usually, especially when large quantities of material are to be illuminated, such methods are not practical, and relatively few light sources are actually used. Sunlight at ordinary altitudes has a lower wavelength limit, between 3,000 and 2,900 angstroms. The carbon arc gives a continuous spectrum with the cyanogen bands superimposed. The intensity of the continuum falls off rapidly toward the shorter wavelengths. So-called "sun lamps" have a continuous spectrum of hot tungsten plus the lines of the mercury arc. The most effective sources in use are quartz mercury arcs which emit a line spectrum. In the "hot" arc, operated on 110 or 220 volt circuits, the strongest lines are a group at 3,660, 3,130 and 2,537 angstroms. In addition there are a number of weaker lines. The "cold" arc, which contains inert gases and mercury vapor, has over 95 per cent of the effective energy concentrated in the 2,537 line.

The most important chemical effects produced by light in this region can be classified into three groups: (1) decomposition reactions, (2) rearrangements and (3) sensitized reactions. It is not surprising to find that absorption of ultraviolet light causes the decomposition of many molecules. The energies absorbed at various wavelengths, expressed as kilocalories per mole, are listed in the following tabulation:

ν	F
4,000	71
3,130 (Hg)	91
2,850	100
2,537 (Hg)	112
2,000	142

Let us compare these values with the magnitudes of the energies required to break the various types of bonds which are found in organic molecules. These are as follows (values given are approximate averages of various estimates):

C — C	80	C — H	100
C = C	150	C — O	82
C \equiv C	180	C — Cl	75

It is evident that if all of the energy absorbed can be converted into vibrational energy at a single place in the molecule, it is sufficient to break any single bond if the wavelength absorbed is below 2,850 angstroms and suffices for all except the C-H bond at wavelengths as long as the 3,130 line of the mercury arc. The fact that sufficient energy is present in the molecule to cause dissociation does not necessarily mean that such a dis-

sociation must occur. Thus even such a simple molecule as I_2 , which is dissociated into atoms by light in the range 5,000 to 4,500 angstroms, can absorb light at 2,100 angstroms without dissociation. Other processes which may follow photoactivation are: (1) emission of energy as fluorescence and (2) dissipation of the absorbed energy into vibrational and translational energy of the surroundings.

Any dissociation which may occur is not necessarily confined to the group responsible for the absorption of the light. Thus the characteristic band of the aldehydes and ketones, with a maximum at 2,800 angstroms, is attributed to the carbonyl group, yet the bond broken is not the carbon-oxygen but a carbon-carbon bond. For example, acetone is split into methyl and acetyl radicals. It is not necessary that the products of dissociation shall be free radicals. In the case of acetyl bromide the evidence indicates that some of the photoactivated molecules split into methyl bromide and carbon monoxide. Another and somewhat more complex case is that of the cyclic ketone, menthone, which Norrish reported splits off an isopropyl side chain to form propylene, the rest of the molecule forming a new cyclic ketone. Many other examples could be cited, as decomposition reactions form the most extensively studied group of photochemical reactions. Much work has been done also on the secondary reactions among the fragments produced by the action of light. As yet no general rules can be set up for predicting the mode of decomposition which will follow photoactivation. Some indication of the complexity of the problem is afforded by such a simple molecule as methyl formate, which yields as decomposition products hydrogen, carbon monoxide, carbon dioxide, methane, ethane and methyl alcohol.

The most extensively studied rearrangement reactions are the cis-trans isomerizations in compounds which may be looked on as substituted ethylenes. In these, photoactivation results in the removal of the restrictions of the double bond so as to permit rotation from the cis to the trans form or the reverse. The effective wavelengths for such transformations are usually between 3,000 and 2,500 angstroms and also at shorter wavelengths. Some specific examples which have been studied in detail are: maleic to fumaric acid, isocinnamic to cinnamic acid and the dichloro- and dibromoethylenes. Another kind of rearrangement is illustrated by the transformation of orthonitrobenzaldehyde into orthonitrosobenzoic acid. In this reaction an oxygen atom moves from a NO_2 group and converts an aldehyde group into a carboxyl. Many other rearrangements have been observed, but in many cases the mechanism of the reaction has not been established.

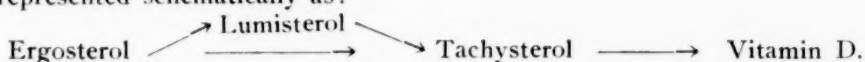
The sensitized reactions differ from the others only in that the molecule which absorbs the light is not involved in the net reaction which occurs in the system. Thus oxalic acid is decomposed by visible light if uranyl salts are added, but requires light well down in the ultraviolet region if such a sensitizer is not present. Perhaps the most widely known reaction of this kind is the photosynthetic process in plants in which chlorophyll is the sensitizer.

The examples which have been cited suffice to show that ultraviolet light is capable of disrupting a molecule or at least of producing some major changes in the molecule. In working with simple systems the photochemist has been concerned with the nature of the primary processes and how they change with wavelength. In more complex systems the problem is more often one of finding a wavelength of light which will produce a desired effect without producing an undesirable effect by acting on some

other substance present in the system. It is from this point of view that I wish to discuss some effects of ultraviolet light on biologic systems. The particular topics which I shall discuss are: (1) the lethal action of ultraviolet light on micro-organisms, (2) the formation of vitamin D by irradiation of ergosterol, (3) the erythemic action and (4) the sensitization of cattle and sheep by hypericin.

As some examples of the lethal effect of ultraviolet light let us consider the action on *Staphylococcus* and on *Chlorella vulgaris*. The threshold for the effect on *Staphylococcus* is at about 3,000 angstroms for high intensities but moves toward shorter wavelengths at low intensities. The maximum effect is at about 2,600 angstroms. The curve for *Chlorella* is similar, but much higher intensities are required to produce an effect. The lethal effect is often attributed to the denaturation of the proteins which is brought about by light of these wavelengths because of the similarity of the protein absorption and the sensitivity curves. This is not conclusive evidence, since there are many organic molecules which have absorption curves of this form. Furthermore the energy absorbed is so great that some molecules may be decomposed and the fragments have some toxic action. The effective wavelengths as given are present only in relatively small amounts in sunlight; hence such light does not have great germicidal powers unless some sensitizer is present. On the other hand, the 2,537 angstrom radiation obtained from the mercury arcs is quite effective.

The formation of vitamin D from ergosterol has been studied extensively. Since the empiric formulas are the same, $C_{28}H_{44}OH$, the effect of irradiation must be to bring about a rearrangement. The structure of ergosterol, as established principally by Windaus and his associates, shows it to be a cyclic compound somewhat distantly related to phenanthrene, with a long partially unsaturated side chain. The absorption of light by this molecule has been detected at as long a wavelength as 3,130, but it really becomes appreciable at about 3,000 and rises in a series of maximums toward short wave wavelengths. The highest maximum is at 2,800, after which the absorption decreases and becomes almost constant between 2,200 and 2,400 angstroms. At 2,537 the absorption coefficient is about one-third the maximum value. The changes which are brought about by the absorption of this light may be represented schematically as:



It is not certain that the process must go through lumisterol. The changes in the molecule corresponding to these steps are as follows: ergosterol \longrightarrow lumisterol, a geometric rearrangement from a compound in which a methyl group changes from cis to trans relative to the OH; lumisterol \longrightarrow tachysterol, the ring by the above methyl opens and a double bond is formed at the side of the opening; tachysterol \longrightarrow vitamin D, the double bond shifts so that the CH_3 becomes a CH_2 . The energy absorbed is ample to bring about any of these changes, although it is rather difficult to form a physical picture of the cis-trans change involved in the first step.

Various light sources have been used in the preparation of vitamin D. Sunlight is not very effective because of the small absorption by ergosterol at the wavelengths present in that light. However, the abundance of sunlight makes it an important source for this transformation. Both the hot and the cold mercury arcs are effective, primarily because of the 2,537 angstrom radiation. Windaus used a magnesium spark which has three very intense lines near 2,800 angstroms, the region of maximum absorption by

ergosterol. Both Windaus and co-workers, and Daniels and associates, found no variation with wavelength in the efficiency of formation of vitamin D from ergosterol. Any choice of wavelength for this process must be based on a freedom from undesirable side reactions.

Two processes which accompany the formation of vitamin D may be considered as undesirable when the processes are occurring in the human system. They are the erythemic action and the transformation of vitamin D on illumination into several substances, one or more of which is toxic (toxisterol, for example). The results in the literature are contradictory as to the effect of wavelength on the latter process. Windaus reported no variation, although some earlier workers had claimed that the shorter wavelengths were more efficient at producing a toxic material. On the other hand, the erythemic reaction curve appears to be well known, at least with respect to its form. The erythemic reaction curve begins at 3,150, rises to a maximum at 2,960, then drops to a minimum at about 2,800, after which it rises to a rather flat maximum at 2,500. If the effectiveness of the light at 2,960 is taken as 100, that at 2,537 is 55, and around the minimum at 2,800 the values are from 6 to 9. From these figures we see that the same portion of sunlight which is relatively ineffective in irradiating ergosterol because of low absorption is very effective in producing erythema. Furthermore, the mercury arcs which supply primarily 2,537 angstroms light are efficient in both processes. On the other hand, the light of the magnesium spark falls in the minimum of the erythemic effect and near the maximum of the ergosterol absorption. It follows that for a given total amount of energy (in this region of the spectrum) which falls on the body, that from the magnesium spark produces far less erythema than either of the other sources. On the other hand, the beneficial effects are at least as great if not greater. It may be pointed out here that the lethal effect of the magnesium lines on micro-organisms is nearly as great as that of the 2,537 mercury line.

The fourth example of the biologic effects of radiation, that of hypericism in animals, is really not an action of ultraviolet light, since the animals become sensitive to the range 5,400 to 6,100 angstroms, which is about the middle of the visible spectrum. This is, however, a striking example of a sensitized reaction. The details of the chemical processes involved are as yet unknown, but it has been established that a red fluorescent pigment, hypericin, which is found in St. Johnswort (*Hypericum perforatum*) is the sensitizer. This substance has been found in the skin of animals sensitized by being fed this plant, and the sensitivity curve has been found to correspond to the absorption curve of an aqueous solution of hypericin at pH 7.5. The exact chemical nature of the pigment is not known, but the available evidence suggests that it is partially reduced methyl, polyhydroxy derivative of helianthrone. The action of this substance on irradiation is probably similar to that of other dyes which sensitize reactions in solution. Regardless of what the details of the chemical action are, this reaction is of interest in that it shows that reactions in the skin of an animal can be sensitized by substances introduced in the food. In this particular case the effect is unfortunately harmful, but it is possible that sensitizers exist which will produce beneficial effects. The fact that the ergosterol to vitamin D transformation is independent of the wavelength used provided it is in the absorption range of ergosterol suggests that the radiant energy supplied is more than the minimum required to bring about the change. It is quite possible, therefore, that sensitizers which absorb at longer wavelengths can be found for this reaction. Since one of the steps in the change involves the breaking of a bond, it is unlikely that the reaction can be sensitized

to wavelengths longer than 4,000 angstroms. Even if it could be sensitized to visible light, it is improbable that any human being would be interested in having his color changed, even if the results were beneficial. The most desirable result to achieve would be to sensitize the beneficial reaction but not affect the formation of the toxic substances which appear on overexposure at the short wavelengths. Fortunately experiments of this type can be carried out in solutions first and then when some apparently suitable sensitizer has been found can be extended to animals.

In conclusion let us consider briefly the suggestion for the improvement of ultraviolet treatments contained in the previous work. The search for a sensitizer just mentioned involves a long and carefully planned program of research. If it should be successful, one of the benefits might well be that people could obtain as much beneficial action from sunlight in the winter as is possible in summer. The more readily adopted suggestion, however, is to replace or at least supplement the mercury arc in ultraviolet therapy by a magnesium arc or spark. Such a change would give at least as much beneficial action as the mercury arc, with only one-sixth to one-tenth as much erythemic action. The greatest danger with the magnesium arc would be the production of toxic substances by overexposure. Of course, this difficulty exists also with the mercury arc, but in that case it also accompanied by severe erythema. The correct dosage will have to be determined by experiment, and it probably will be found that considerably larger doses can be given with the magnesium arc without discomfort than can be given with the mercury arc.

In actual practice the spark will probably prove to be more satisfactory than the arc with magnesium electrodes. The reason for this is that in an arc the electrodes get very hot, and, since magnesium is a relatively low melting metal and reacts with both the nitrogen and the oxygen in the air under such conditions, the electrodes will be used up rapidly. In the spark, on the other hand, the electrodes remain relatively cool and the electrodes will last for a considerable time. The best type of a spark to use in order to obtain a maximum intensity at approximately 2,800 angstroms is a condensed spark with very little inductance in the circuit. The principal objection to such an arrangement, the noise, can be eliminated by enclosing the spark gap.

Summary

It has been pointed out that the range of wavelengths in the ultraviolet usually available for causing photochemical reactions is from 4,000 to 2,000 angstroms. The types of reactions caused by different regions in this range have been indicated. The following four processes have been discussed as photochemical reactions: (1) the lethal action of ultraviolet light on microorganisms, (2) the formation of vitamin D by irradiation of ergosterol, (3) the erythemic action, and (4) sensitization by hypericin. It has been pointed out that for many purposes the magnesium spark is a better light source than the commonly used mercury arc.



THE TREATMENT OF SHOCK WITH SPECIAL REFERENCE TO THE USE OF HEAT AND COLD *

WARREN H. COLE, M.D.

CHICAGO

Before the treatment of shock is discussed, various factors in the pathogenesis should be presented, since the rationale of the various forms of treatment are so dependent on pathogenesis and the mechanisms producing the shock. Shock itself might be defined as a certain type of peripheral vascular failure, resulting in a depression of body functions. It may, of course, be caused by any of numerous conditions, but the two major factors producing it are hemorrhage and tissue trauma. Nervous shock, and shock due to poor anesthesia, anaphylaxis, etc., will not be considered here.

As Blalock¹ has emphasized, the important initial factor in the production of shock is the decrease in circulating blood volume, which has a definite mechanical and physiologic action in lowering the blood pressure. To compensate for this decrease in blood volume, the body resorts to peripheral vasoconstriction in an effort to maintain blood pressure. It is this vasoconstriction which results in the blanching and cold skin. The decrease in blood volume and the peripheral vasoconstriction (particularly the former) result in a decrease in blood flow. A decrease in blood volume and blood flow results in tissue anoxia. The amount of oxygen supplied the tissues under these circumstances is not sufficient to maintain the life of the cell at normal temperature, although it might maintain life at a lower temperature, as will be discussed later. The explanation of this is obvious, since tissue at a reduced temperature requires less oxygen because of the reduced metabolism. Anoxia of the cells of the capillary wall results in an increase in capillary permeability (Krogh,² Landis³). This increased capillary permeability results in the loss of plasma from the vascular tree into the tissues locally and probably systematically. There are, then, three possible sources of fluid loss, namely, (1) hemorrhage, (2) loss of plasma into the injured tissue and (3) loss of plasma through the capillaries throughout the body. However, the work of Fine and Seligman⁴ contradicts the third possibility; they gave plasma proteins tagged with radioactive isotopes intravenously to animals in shock, but were unable to recover them throughout the body, a fact indicating that there was not a generalized loss of plasma through the capillaries. The factors mentioned result in a true oligemia and a true hemoconcentration.

Years ago it was considered that tissue anoxia might result in the formation of toxic products, which might exert deleterious effects on the body, including lowering of blood pressure. Proof of this theory has never been available, and therefore it was cast aside in favor of the loss of blood and plasma, which was an obvious factor, easily discernible. It is well known that traumatized tissue becomes edematous owing to the accumulation of plasma, which is thereby lost to the blood stream; this loss of fluid is sometimes referred to as "white hemorrhage." This local fluid loss has been thoroughly discussed by Parsons and Phemister,⁵ Blalock⁶ and others. It always seemed logical to me that if tissue anoxia was really present to a significant degree, there would be a splendid opportunity for the formation

* From the Department of Surgery, University of Illinois, College of Medicine.

¹ Read at the Twenty-second Annual Session of the American Congress of Physical Therapy, Chicago, September 10, 1943.

of chemicals foreign to the body, and probably toxic as well. The recent studies of Bywaters,⁷ demonstrating a toxicity due to myohemoglobin in crushing injuries, and the toxic products in thoracic duct lymph draining from crushed extremities, as shown by Blalock,⁸ indicate the possible role of toxic products. If toxic products are formed in crushed tissue not yet subjected to bacterial decomposition, it appears that they may likewise be formed in tissue subjected to anoxia, which in reality is a similar type of injury, or trauma. I predict that in time to come the toxic chemical changes, particularly in burns, will be given more consideration in shock.

Death itself could be attributed to many factors. The sharp drop in blood pressure with the resultant anoxia would in itself be sufficient to account for death.

Treatment

Prophylactic Treatment. — It is essential that prophylactic therapy be discussed, since it is so important in the prevention of shock and in decrease of intensity of that already present. During an operation, it is essential to maintain the most effective hemostasis possible to minimize the loss of blood. Equally important is gentleness in the handling of tissues. Mauling of tissues is to be condemned from all standpoints. Good anesthesia is essential, since a shift to levels deeper than necessary is conducive to shock. Exposure of the tissues to the air must be held to a minimum. It is essential to relieve apprehension with morphine or equivalent sedatives. The physical condition of the patient is particularly related to the rapidity of development of shock. For example, it was discovered in World War I that soldiers who had been deprived of adequate water and food for a few days would develop shock with trivial wounds. This, of course, is likewise being observed in the present war. In the engagements with the Japanese in the tropical islands it has been noted particularly that soldiers who have been forced to plow their way through the jungles and fight for days without sleep and adequate food or water will develop shock with trivial wounds, and after minor operations. In other words, the principles already mentioned and those discussed hereafter under "Active Treatment" must be instituted in treating such patients to prevent the shock which is so apt to occur after minor operations.

Active Treatment. — Naturally, one of the most important factors in active treatment is the control of hemorrhage. Every one realizes the importance of this obligation, but unfortunately many errors are made in the mechanisms used in its control. Errors are made particularly by first aid workers not trained medically, but unfortunately many physicians are likewise guilty. The most important error is the injudicious use of the tourniquet. It has been said by British writers that more damage is done by the tourniquet in war injuries than good is derived therefrom. The chief factor involved in the mechanism of damage is the total ischemia produced in the extremity distal to the tourniquet. It is true that the tissues of an extremity of a healthy person can tolerate the use of a tourniquet for two or three hours or more. However, tissues of an extremity injured by war missiles may be so badly damaged that block of its blood supply for as long as thirty minutes may result in death of major portions of the extremity which otherwise would have survived. The point is that hemorrhage may be controlled by pressure dressings without the use of a tourniquet, except when the major vessel (e. g. the femoral) is involved. Any pressure dressing applied should utilize a large quantity of dressings in the wound. It is usually preferable to maintain pressure by the hand over the dressing for several minutes before applying a bandage. An improved dressing, consisting of grade A cotton waste (which is very resilient), has been devised by Colonel

Gallagher.⁹ This allows pressure to be exerted against the wound to a degree which will still permit blood to reach the distal part of the extremity through collateral vessels.

After control of hemorrhage, the next therapeutic obligation is the administration of blood or plasma. It is well known that death due to hemorrhage is not due primarily to loss of the red cells; this has permitted the emergency use of plasma for shock due to hemorrhage. Plasma is quite effective in restoring the blood pressure, but I wish to emphasize that in shock due to hemorrhage blood is superior to plasma and should be used if available. The British appreciated this advantage and resorted to the use of blood transported by plane from distant points in the North African campaign. It should be emphasized, however, that plasma is far superior to blood in treating shock produced by burns; nevertheless, according to the British, blood should be administered for shock due to burns if plasma is not available. It is, of course, appreciated that from the standpoint of availability pooled plasma has a great advantage over blood, since grouping and matching are unnecessary. Perhaps the most serious error made in the administration of blood or plasma is the administration of too little. For example, the blood loss in a given patient in shock may be as great as 2 liters or more. It is obvious that one transfusion of 500 cc. of blood will provide only a fraction of the amount needed.

It is essential that complete rest of the patient be secured. He is put to bed and given adequate doses of morphine to control pain and apprehension. Gentleness in transportation is extremely important, since rough handling of the patient may start a recurrent hemorrhage and may increase the local fluid loss at the site of injury. Institution of the shock position with the head lowered is important and should be utilized as a routine. This prevents the severe cerebral anemia which follows the decreased blood flow associated with low blood pressure. In the presence of a decreased blood volume and blood flow, there will be more circulation in the brain and a greater opportunity for oxygen transfer when the head is maintained at a level below that of the rest of the body.

Fluids should be administered immediately but, as stated, should first consist of blood or plasma. However, in the interval required to obtain blood or plasma, it is good therapy to start administration of saline and dextrose solution. A solution commonly used is 5 per cent dextrose in physiologic solution of sodium chloride. I wish to emphasize, however, that saline and dextrose solution alone represents poor therapy for shock, since such fluids are not retained in the blood stream but leave it rapidly, washing out electrolytes and some proteins. If a colloid, such as plasma or blood, is given simultaneously, fluids containing electrolysis will be held in the vascular tree.

Only a few medicinal or chemical agents are of value in the treatment of shock. A discussion of these agents should be prefaced by the emphatic statement that stimulants such as epinephrine are very harmful, and strongly contraindicated. The rise in blood pressure created by the vasoconstrictive action of the epinephrine is very temporary and followed by a severe reaction of the reverse type which might be sufficient alone to result in death. Adrenal cortex has been found mildly beneficial by some observers, although there is not total agreement regarding its use. In some studies conducted in our department,¹⁰ we found that in a series of patients undergoing prolonged major abdominal operations to whom adrenal cortex extract was administered, the pulse rate averaged 8 beats per minute lower and the systolic blood pressure 12 mm. higher than in a comparable series of patients not receiving adrenal cortex extract. This beneficial effect was much more

marked in animal experiments. For example, of a series of animals subjected to the trauma of intestinal massage, the average drop in systolic blood pressure after forty minutes of massage was 19.5 mm. in the group receiving adrenal cortex extract, as contrasted with a drop of 35.3 mm. in animals not receiving the extract prophylactically. The dose should be massive, consisting of 10 cc. repeated every two or three hours for perhaps three doses. From experimental data available to date, it does not appear that the synthetic desoxycorticosterone is effective in the prophylactic treatment of shock. In our experiments adrenal cortex extract was not very effective when given after shock was present. Since it is given subcutaneously or intravenously by hypodermic syringe, it need not displace any other type of parenteral therapy.

Through the initial work of Hartman¹¹ and associates during the past few years, it is known that pectin is an effective colloid in combating shock manifestations, largely because it tends to maintain an increased blood volume. Work done by Figueroa and Lavieri¹² in our department confirms the results of Hartman and associates. For example, the former workers noted in a series of patients receiving pectin that the average increase in blood volume was 525 cc., as compared with an average increase of 160 cc. in a series receiving physiologic solution of sodium chloride. The beneficial effect of pectin in shock due to hemorrhage was vividly illustrated in a patient observed by Figueroa.¹² This patient was admitted to the emergency room in shock, suffering from a stab wound in the right thigh. The pulse rate was 120, and the systolic blood pressure was 86. It happened that neither blood nor plasma was immediately available. Administration of pectin was started, and the effect was so gratifying that blood was not given. Over a period of two and one-half hours the patient received 1,500 cc. of 0.75 per cent pectin solution intravenously. At the end of this time his blood pressure was 124 systolic and pulse rate had dropped to 72; all manifestations of shock had disappeared. This represents a massive dose, since the average dose might be 500 cc. of 0.5 per cent or 0.75 per cent pectin solution.

Oxygen therapy is particularly important in the treatment of shock, since anoxia is one of the major factors in the serious manifestations, and probably in the lethal outcome, as shown by the experiments of Schnedorf and Orr.¹³ Oxygen is usually given by means of a nasal catheter inserted into the nasopharynx through the nose. Care must be taken not to insert this far enough for it to enter the esophagus, since serious effects (distention and rupture of the stomach) may result therefrom. A flow of 6 to 7 liters per minute is maintained. If oxygen administration by means of a nasal catheter is impractical owing to the presence of a stomach tube, etc., an oxygen tent is used.

The question as to the use of heat or cold is worthy of considerable discussion. The application of heat as practiced in the treatment of shock for years past has now been proved to be erroneous and actually damaging to the patient. Experimental work of Blalock and Mason (1941),¹⁴ corroborated by the work of Wakim and Gatch,¹⁵ more recently has served to prove the error of heat therapy in shock. The foundation for this work was laid by Allen,¹⁶ who showed that in animals death from ligature of the hind leg for eight hours and of the abdomen for three hours could be prevented by refrigeration. The work of Brooks and Duncan,¹⁷ demonstrating that maintenance of ischemic tissue at a low temperature decreased the incidence of gangrene, was equally important in indicating the beneficial effect of reduced temperatures in the viability of damaged tissue. Blalock and Mason¹⁴ used hemorrhage as a mechanism to produce shock in one series, and trauma

to the posterior extremity as the mechanism in another series. They bled their animals 3 per cent of the body weight in a thirty minute period, and increased the temperature by electric lights under the table and blankets over the animal; the temperature was reduced by the application of ice bags. The average rise in temperature in the former instance was 3.7 degrees (C.), and the average drop in the latter was 12 degrees (C.). In the experiments with hemorrhage, 9 of the 14 control animals died. The average duration of life was three hours and thirty-three minutes. All of the 9 animals subjected to heat therapy died, revealing an average duration of life of five hours and twenty-nine minutes. All animals in shock subjected to cold likewise died, but with an average duration of life of eleven hours and thirty-six minutes. Such evidence indicates clearly that heat is much more damaging than cold. Blalock and Mason drew the following conservative conclusions:

Significant elevations of temperature decrease the chance of life and shorten the period of survival. The application of cold does not increase the chance of survival but is accompanied with a lengthening of the survival of an animal with a low blood pressure. Significant elevations of temperature cause more disastrous effects than do depressions of similar degree.

Wakim and Gatch¹⁵ were unable to produce a consistent degree of shock by trauma, and therefore resorted to exposure of abdominal viscera with stripping of intestines as their method of producing shock. They used dogs, rabbits, guinea pigs and rats, and placed the animals on ice bags or hot water bottles to obtain their thermal therapy. From their experiments Wakim and Gatch concluded that "cold and heat proved to be deleterious to the life of animals in shock, and external temperature in the neighborhood of that in the mammalian body to be optimal for the survival of shocked animals."

Comment

The experiments referred to do not indicate that patients in shock should be subjected to refrigeration. They simply indicate that administration of heat may be definitely harmful. In other words, the thermal therapy of a patient in shock should not be active in either direction, i. e., heat or cold. Ordinarily, thermal therapy may be ignored, since room temperature, with perhaps the application of a single blanket as utilized in the postoperative wards of a hospital, will be the most favorable circumstances from the standpoint of heat or cold. The patient's temperature, particularly in the extremities, may drop several degrees. This appears to be a protective reaction on the part of the body, and exposure of the patient to room temperature will not elevate the temperature significantly until the patient is out of shock.

The most significant deleterious effect from heat is derived from the increase in the metabolic rate and consequent increased oxygen consumption. Since the body already is in a state of anoxia, this increase in the metabolic rate and oxygen consumption becomes harmful. A second reason why heat is deleterious is that it produces vasodilatation, replacing the vasoconstriction which is a protective mechanism improving the blood pressure and consequently the blood flow. The vasodilatation results in reduction of the circulating blood volume, thereby counteracting the efforts of the body to combat the loss in the blood volume. The work of Gibbon and Landis¹⁸ and others offers proof of this reasoning. A third deleterious effect from heat therapy is related to the increase in loss of fluid by perspiration, and into the tissues through increased capillary permeability. The work of Landis¹⁹ suggests that the vasodilatation increases the capillary pressure, thereby resulting in an increased transudation of plasma through the capillary wall.

It is impossible to put too much emphasis on the necessity of treating shock immediately. There is almost as much urgency in the treatment of shock as in the treatment of a slow persistent hemorrhage, largely because the two conditions are very similar. The justification of such a statement lies in the fact that the condition of shock reaches an irreversible state in a few hours, after which the deleterious effects cannot be remedied even by treatment of the most expert type, and death ensues. As a matter of fact, the speed of recovery from shock is related directly to the duration of shock. One of the explanations for the relatively low mortality rates in the military casualties of this war, at least in the Allied armies, lies in the fact that shock is now treated by means of plasma transfusions, etc., as a first aid procedure on the battlefield, long before definite therapy can be executed.

Bibliography

1. Blalock, Alfred: Principles of Surgical Care, Shock and Other Problems, St. Louis, Missouri, C. V. Mosby Co., 1940.
2. Krogh, August: The Anatomy and Physiology of Capillaries, ed. 2, New Haven, Conn., Yale University Press, 1929.
3. Landis, E. M.: Microinjection Studies of Capillary Permeability: III. The Effect of Lack of Oxygen on the Permeability of the Capillary Wall to Fluid and to the Plasma Proteins, *Am. J. Physiol.* **83**:528 (Jan.) 1928.
4. Fine, J.; Seligman, A. M., and Frank, H. A.: Traumatic Shock, *Ann. Surg.* **118**:238 (Aug.) 1943.
5. Parsons, E., and Phemister, D. B.: Hemorrhage and "Shock" in Traumatized Limbs, *Surg., Gynec. & Obst.* **51**:196 (Aug.) 1930.
6. Blalock, A.: Experimental Shock: Cause of Low Blood Pressure Produced by Muscle Injury, *Arch. Surg.* **20**:959 (June) 1930.
7. Bywaters, E. G. L.: Crushing Injury, *Brit. M. J.* **64**3 (Nov. 28) 1942; Bywaters, E. G. L., and Popjak, G.: Experimental Crushing Injury, *Surg., Gynec. & Obst.* **75**:612 (Nov.) 1942.
8. Blalock, A.: A Study of Thoracic-Duct Lymph in Experimental Crush Injury and Injury Produced by Gross Trauma, *Bull. Johns Hopkins Hosp.* **72**:54 (Jan.) 1943.
9. Gallagher, Col. J. L.: A New Multi Purpose War Dressing, *Military Surgeon* **92**:609 (June) 1943.
10. Helfrich, L. S.; Cassels, W. H., and Cole, W. H.: Cortical Extract in the Treatment of Shock, *Am. J. Surg.* **55**:410 (Feb.) 1942.
11. Hartman, F. W.; Schelling, V.; Harkins, H. N., and Brush, B.: Pectin Solution as a Blood Substitute, *Ann. Surg.* **114**:212 (Aug.) 1941.
12. Figueroa, L., and Lavieri, F. J.: Experimental and Clinical Use of Pectin in Shock. To be published.
13. Schnedorf, J. G., and Orr, T.: Beneficial Effects of Oxygen Therapy in Experimental Shock, *Surg., Gynec. & Obst.* **73**:79 (July) 1941.
14. Blalock, A., and Mason, M. F.: A Comparison of the Effects of Heat and Those of Cold in the Prevention and Treatment of Shock, *Arch. Surg.* **42**:1054 (June) 1941.
15. Wakim, K. G., and Gatch, W. D.: The Effect of External Temperature on Shock, an Experimental Study, *J. A. M. A.* **121**:903 (March 20) 1943.
16. Allen, F. M.: Surgical Considerations of Temperature in Ligated Limbs, *Am. J. Surg.* **45**:459 (Sept.) 1939; Physical and Toxic Factors in Shock, *Arch. Surg.* **38**:155 (Jan.) 1939.
17. Brooks, B., and Duncan, G. W.: The Effects of Temperature on the Survival of Anemic Tissue, *Ann. Surg.* **112**:130 (July) 1940.
18. Gibbon, J. H., Jr., and Landis, E. M.: Vasodilatation in the Lower Extremities in Response to Immersing the Forearms in Warm Water, *J. Clin. Investigation* **11**:1019 (Sept.) 1932.
19. Landis, E. M.: Capillary Pressure and Capillary Permeability, *Physiol. Rev.* **14**:404 (July) 1934; Landis, E. M., and Gibbon, J. H., Jr.: The Effects of Temperature and of Tissue Pressure on the Movement of Fluid Through the Human Capillary Wall, *J. Clin. Investigation* **12**:105 (Jan.) 1933.

REHABILITATION *

HARRY E. MOCK, M.D.

CHICAGO

In World War I many new branches of service were added to the medical departments of the Army and Navy. As assistant chief under Colonel Frank Billings of the Division of Physical Reconstruction and Rehabilitation in the Surgeon General's office, I played a part in initiating certain of these services. Rehabilitation of the below-par soldier and rehabilitation of the disabled soldier in an effort to make the one fit for army service and the other fit for future economic usefulness were the underlying purposes of these efforts.

Thus, development battalions, physical therapy and occupational therapy, vocational training in the best hospitals, convalescent centers in nineteen of our largest cantonments, where the principles of rehabilitation were put into practice, and, finally, limited service were the chief functions added to the medical department of the Army in World War I.

It was a great fight to initiate these services in a medical department befogged by tradition and slow to adopt changes. That they were good services, worthy of perpetuation, is proved by the fact that limited service, convalescent care and other types of rehabilitation are more or less a fixture in the medical departments of the Army and Navy today.

We of the other war gave you the torch. Carry on! Become rehabilitation-minded throughout your war service to the end that the future of the disabled, when peace returns to the world, will reach a higher plane than it has today.

Rehabilitation of the disabled implies restoration to economic usefulness, security from want. Its antithesis is dependency—dependency on the family, on the community, on the state or on the federal government. Many persons lack the desire, capacity or initiative for rehabilitation; they are comparable to those who fail to take advantage of the opportunities for education. Pensions and compensations are crutches which retard rehabilitation just as surely as the crutches on which a temporary cripple becomes dependent retard his recovery. A too sympathetic family, or a family anxious to cash in on all the monetary advantages inherent in a work or war disability, or a paternalistic state that furnishes all the securities from want just as a doting parent provides every want and spoils the child—these and similar agents are often the intangible factors or crutches which prevent rehabilitation and which beget dependency.

Society owes a deep debt of gratitude to its disabled soldiers and sailors. After the Civil War we attempted to pay this debt by meager pensions and by establishing old soldiers' homes. These were havens of dependence and comfort for many an old soldier, but a great many others refused to take advantage of them and rehabilitated themselves. During World War I, President Wilson stated, "This nation has no more solemn obligation than healing the hurts of our wounded and restoring our disabled men to civil life and opportunity." However, after that war veterans' hospitals too often became old soldiers' homes for many a soldier. Free medical care for ex-soldiers with war or nonwar disabilities was provided. Greater pensions became the rule. These provisions were essential for a certain minority of

* Read at the Twenty-second Annual Session of the American Congress of Physical Therapy, Chicago, September 9, 1943.

permanently and hopelessly disabled soldiers, and no one would raise a voice against such benevolence. However, a certain number of old soldiers took advantage of the provisions and became dependents, thus reducing the effectiveness of the provisions for rehabilitation. But, again, the majority of our soldiers climbed above these temptations to be spoiled by an ever expanding paternalistic state and rehabilitated themselves.

We are a richer nation now, or at least we spend more freely. Paternalism is in the saddle. After this war marvelous provisions for paying our debt of gratitude to the soldiers, disabled or otherwise, will emerge. Many of these will rightly be extended to the disabled from the industrial army. In our enthusiasm they may include paternalistic advantages for all our people. For those incurables and cripples who are beyond the help of medical service and all the adjuncts of rehabilitation, far better provisions for their comfort and welfare than have ever yet been conceived should be provided. But the future program for all our people and especially for the partially disabled in our midst should be kept free of all temptations to dependency. Unless this is done, our efforts to rehabilitate all the disabled soldiers from this war, and from the industrial army, will go farther astray than they did after the last war.

Both the psychology of a sick nation crippled by a long depression and crippled again by a gruesome war, and the psychology of the individual crippled by war wounds or by civilian wounds, must be altered. Both nation and individual must cease to think of security from want in terms of dependency, whether on the family, the community or the state. Both must return to the psychology of our pioneer forefathers, who stressed the freedom of the nation and individual freedom and demonstrated such freedom by pride in individual enterprise and accomplishment.

A revival of the pioneer spirit which expressed itself in such homely aphorisms as "sink or swim," "paddle your own canoe" and "honesty is the best policy" is essential if rehabilitation of the nation and of the individual is to be accomplished.

122 South Michigan Boulevard.

Discussion

Samuel R. Rubert, Capt., M.C. (Salina, Kansas): Relative to the presence or absence of objective findings it is well to remember that one should not consider the absence of specific findings in a post-traumatic skull case an indication that the patient is a neuropsychotic and that subjective symptoms are entirely lacking or imaginary. Many persistent headaches unquestionably exist in which we are incapable of finding demonstrable pathology with our methods of diagnosis.

Backs present a similar problem. Persistent backaches do not necessarily indicate a malingerer because findings are entirely negative. Neither should we consider fusion or disc surgery the answer to all backaches for many get well with conservative treatment. The problem of backache and headache is not solved by relegating these patients to the category of malingerers or psychotics.

Dr. Harry E. Mock (closing): I am glad the question was brought up if I gave a false impression. I divided the post-traumatic syndrome into the true organic and the psychoneurotic. It is not present

by any means in every case. I have tried to go over my figures very carefully, and I would say that only about 20 per cent of my cases of skull fracture with injury to the brain present rehabilitation problems, considering those true organic conditions which I mentioned. Rehabilitation of the psychoneurotic must be handled with intelligence and caution lest a permanent psychoneurosis be established. Dr. Solomon was surprised to know that St. Luke's was the first hospital in Chicago to have a physical therapy and occupational therapy department, and I was responsible for their establishment. This was before Dr. Coulter got out of the Army and came here. It has been a great thing for Chicago that we have had Dr. Coulter.

I have been personally interested in my skull fracture cases until the patient is well. If the patient is dismissed too soon a number of factors may arise.

I was interested in Henry Brown's report on the center he was in charge of in England. (And, by the way, every one of you should possess the new book 'Rehabilitation of the War Injured,' Philosophical Library

of New York, 1943.) By getting the patients into a center, taking an interest in them and following them through in their graduated exercises, the English are returning a high percentage to duty. But they are finding a certain percentage—just about half of those who have headaches, dizziness and so forth—for whom repeated examinations by the psychologist and the psychiatrist fail to reveal any organic cause. Some of them are allowed to return to duty, and they go along all right until some little thing occurs which happened just before they were wounded, and then the psychoneurotic phenomena reappear.

Who makes up this group? Nearly every one of them is of the asthenic build, the build Stiller described back in 1870—long, narrow chest, acute intercostal angle, pot belly and so forth—with all the gastrointestinal neuroses that go with it. If the patient is not of that type, his mother or father or some other member of the family had had an emotional upset of some kind in the past—emotional upsets, headaches in the family, etc. The past history is followed through the occupational record, school record and family record, and almost every patient put in the psychoneurotic class has a background that justifies such a classification.

The other half of the group have organic reasons back of the symptoms, and I tried to make that plain in my talk. Do not say, as the doctor pointed out, "Oh, he's just a neurotic." Fifty per cent of those about whom you might say that have real organic findings; the other 50 per cent have all these

things that I speak about, and they are the worst ones to put in some place of dependency and try to rehabilitate.

Now, in regard to the back cases, I am only going to say that I failed to mention the thing that is fundamental in so many of them, and that is the peculiar asthenic type of build, with all the neuroses that go with this type. Stiller and every one who described it missed one of the most important things. Practically all such patients have a flat back. Few have an acute lordosis, but the compensatory curve that is supposed to help hold up the viscera is absent in the majority. Therefore, in the Stiller type they have a general optosis. After you have sowed the seeds of psychogenic origin in their minds, you have a real problem. You have the problem in the housewife and the school child as well as in the compensation case.

I contend that we must evaluate these factors before we operate, put on back braces, or start a long course in physical therapy.

To illustrate: A man brought his son to me, who complained of constant backache, which had been present for years. The son was 32 years of age. When I started examining him, I said to my assistant, "Well, he is characteristic—narrow costal angle, pot belly, long, lanky build—and look at that flat back. And the father said, 'Flat back! Why didn't I ever think of that? You know doctor, I've been a mule buyer for years out in Missouri, and I wouldn't buy a mule with a flat back. They wear out six or seven years quicker than a good mule with a regular curve.'"

Physical Treatment of Disabilities of the Foot Commonly Encountered in Military Service — Dredge

(Continued from page 659)

2. Krusen, F. H.: *Physical Medicine; the Employment of Physical Agents for Diagnosis and Therapy*, Philadelphia, W. B. Saunders Company, 1941, p. 846.
3. Delprat, G. D.: *Ankle Strapping*. U. S. Nav. M. Bull. **39**:564 (Oct.) 1941.
4. Kuhns, J. G.: *Physical Therapy in Disabilities of the Foot*, Chicago, Year Book Publishers, Year Book of Physical Therapy, 1941, p. 312-315.
5. Speed, J. S., and Blake, T. H.: Quoted by Lewin, Philip.
6. Dodd, Harold: Quoted by Lewin, Philip.
7. Hauser, E. D.: *Diseases of the Foot*, Philadelphia, W. B. Saunders Company, 1940, p. 70-118.
8. Morton, D. J.: Quoted by Hauser, E. D.
9. Cozen, L. N.: *The Treatment of Painful Feet in the Army*, Mil. Surgeon **91**:196 (Aug.) 1942.
10. Wiles, Philip: *Some Common Causes of Painful Feet*, Practitioner **146**:389 (June) 1941.
11. Sweet, Norris and Wilmer: Quoted by Lewin, Philip.
12. Webster, D. R.; Woolhouse, F. M., and Johnston, J. L.: *Immersion Foot*, J. Bone & Joint Surg. **24**:785 (Oct.) 1942.

VOLUNTEER PHYSICAL THERAPY ASSISTANTS

The American Physiotherapy Association realizes that the growing need for qualified and registered physical therapy technicians in the armed forces and civilian positions must necessarily be met in part by the work of assistants—as the work of registered nurses is supplemented by that of nurses' aides. The object is to train a corps of women volunteers who will assist qualified physical therapy technicians who remain in civilian positions, releasing other technicians to supply the needs of the armed forces.

To this end the Association has prepared a syllabus for a course for volunteer physical therapy assistants. The prerequisites are: (a) age, 18 to 45 years; (b) physical examination, evidence of satisfactory health; (c) education, high school; (d) character, personality and emotional stability, satisfactory according to reference and interview; (e) achievement, satisfactory completion of course; (f) service, agreement to give a minimum of nine hours per week and to work only under the direction of a senior registered physical therapy technician or a member of the American Physiotherapy Association, who, in turn, is under the supervision of a physician.

The course consists of:

- I. A lecture course of twelve hours.
 - (a) Six hours to be given by a physician specializing in physical therapy.
 - (b) Six hours to be given by a senior member of the American Registry of Physical Therapy Technicians or a member of the American Physiotherapy Association.
- II. A practice course of forty-five hours supervised by a senior member of the American Registry of Physical Therapy Technicians or a member of the American Physiotherapy Association.
- III. A minimum of ninety hours of supervised practice on completion of the lecture and practice courses. Such practice shall not be less than nine hours weekly.

The duties of the volunteer consist of:

Conveyance of patients from their rooms to the physical therapy department for treatment; preparation of patients for treatment; general care of equipment and treatment rooms, including preparation of some simple types of equipment for treatment, under supervision of the technician; keeping of records, making of appointments and other clerical work.

The Illinois Chapter of the American Physiotherapy Association, following the syllabus set up by the Association, is giving a course at the present time. The American Women's Volunteer Service is sponsoring and co-operating in the program, as the American Red Cross sponsors the nurses' aides. The organization has been extremely helpful in securing publicity through local papers, in securing and interviewing applicants, in providing lecture rooms, etc. In the Illinois Chapter a volunteer physical therapy assistant must become a member of the American Women's Volunteer Service. She must complete one hundred and fifty hours of volunteer service before she is eligible to wear the street uniform of that organization. While on duty she wears a smock with the AWVS emblem as well as the APA volunteer physical therapy assistant emblem.

The demand for volunteer physical therapy assistants in the Illinois area exceeds the supply. Requests have been received from eight hospitals in Chicago for volunteers who will serve a total of two hundred and twelve hours a week. Tentative plans have been made to repeat the course. On satisfactory completion of the course the volunteer will serve in these hospitals and with other organizations, such as the Visiting Nurses Association, which have requested them.

The American Physiotherapy Association is encouraging state chapters to make preparations for training volunteer assistants to relieve the technician shortage if one exists in their locality. For further information write to the Association at 495 California Avenue, Palo Alto, Calif., and/or the local chapter.

Causalgic States Following Injuries to the Extremities — De Takats

(Continued from page 652)

points which I omitted to mention, or did not have time to mention.

We have not used refrigeration in any of these causalgic states, but there is no reason why we should not try it. My feeling is that it undoubtedly would promptly relieve the pain. In fact, in a few amputations that I have done, refrigeration, that is, the use of ice packs, has completely relieved the pain.

The question arises, however, what are you going to do when you have to thaw out the limb? It has to be thawed out slowly, of course not rapidly, because in addition to the nerve injury or irritative phenomena, there is the exposure to cold, which undoubtedly is nothing but a small frostbite, and we do know that frostbite is sometimes followed by a causalgic state.

Of course, it is possible that there are hundreds of patients who have been exposed to the same stimulus and did not respond with this mechanism. It is something in the make-up, probably in the

autonomic nervous system which predisposes a patient to such a reaction, but once he is exposed to the reaction, he will have it again and again.

We had a patient who had a severe causalgia after a pain, and we thought we cured her with sympathetic blocks. We received a letter from her physician after she had moved to California, saying that she injured her finger and a causalgic state had developed. He took care of that, and she had a third injury followed by this state, with no element of compensation involved.

As Dr. Elkins stated, in the syndrome in which vasoconstriction is present vasodilatation would be helpful. For instance, late causalgic pain can be abolished with papaverine, but this is not a lasting phenomenon; it wears off, and when it wears off the pain is just as bad, if not worse. Until we have a long-lasting, chronic vasodilator, I do not know whether we will be able to help these patients with drug therapy.



ARCHIVES of PHYSICAL THERAPY

OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.. EDITORIALS ..

PROGRESS IN THE TRAINING OF PHYSICAL THERAPY TECHNICIANS

The educational standards of physical therapy technicians is a subject which greatly concerns all physical therapy physicians. The Council on Medical Education and Hospitals of the American Medical Association with the advice of the Committee on Education of the Council on Physical Therapy and its consultants on education, have recently revised the "Essentials of an Approved School for Physical Therapy Technicians." This revision is the result of considerable study of the problem by those most intimately concerned. Questionnaires have been sent to all the approved schools, and results from this source have been studied by the above groups, and also by the Educational Committee of the American Physiotherapy Association. Practically unanimous agreement was reached as to the prerequisites for admission and the minimum curriculum as appears in the outline adopted by the American Medical Association.¹

The directors of approved schools for training physical therapy technicians further discussed these problems at the Educational Conference held in conjunction with the recent Twenty-Second Annual Convention of the American Congress of Physical Therapy in Chicago. A representative from the Committee on Education of the American Medical Association was present and aided in the interpretation of questionable points in the outline. Some of the highlights of the conference should be of general interest as indicating the present opinions on technicians' training and the suggestions for future changes. The subject of requirements for admission to schools was dealt with first. It was generally thought advisable to maintain the present standards as in the best interests of both physicians and technicians. There is a temporary demand for partially trained personnel to act as technicians' assistants during the emergency and a short course has been set up in Chicago for training such volunteer aides.² The science requirement has been a matter of considerable debate and confusion in the past and is now settled as meaning, as a minimum, any satisfactory course in biology or allied science during a two-year college training, thus giving the schools considerable leeway in interpretation. It is highly recommended, however, that in high school the standard college entrance course should be taken, and in college, physics and chemistry or physical education as well as biology and if possible psychology and sociology. Another important aspect of selection of technicians concerns individual aptitude for a career in physical therapy, particularly in regard to personality. There are recognized tests of value for determining these attributes, and it is likely that a suitable form will be developed either as a part of the registry examination or for use in selection of candidates before entering schools. Special tests have also been developed for evaluation of foreign education which are valuable in judging qualifications of refugees.³

A study of the minimum curriculum has brought out the following points of interest. The most important subjects are anatomy, physiology, path-

ology, therapeutic exercises, hydrotherapy and massage. The number of hours required in the individual subjects may be interpreted with considerable leniency in the different schools, as a good end-result is all that matters. For example, instead of giving entirely didactic lectures, anatomy may be taught in relation to kinesiology, muscle re-education and by the study of patients. The laboratory and practice hours may also be filled quite differently among the individual schools, depending on the facilities available for actual laboratory work and for clinical observation or supervised practice. Among the elective courses training in contagious technic was considered to be of extreme importance.

The new objective type of registry examination, although a subject of considerable criticism at times, has been found to be the best method available for such testing purposes. Constant revisions are being made so that only the most valuable questions will be retained. In the future more emphasis will be placed on the practical examination and a directive giving a definite plan to follow in these examinations will be issued.

It seems likely that there will be more subsidization of physical therapy training. Already a certain number of WAC's are being sent to a few civilian schools for six months' emergency courses, to be followed by three months apprenticeships at army hospitals, after which they will be transferred to the Army Physical Therapy Corps as second lieutenants. In addition, the War Manpower Commission is considering subsidization of training of technicians to meet both military and civilian needs. It has also been recommended as a step toward closer coordination with occupational therapy, that certain subjects which are common to the training of both types of technicians, be given to the combined groups in order to make the most efficient use of the limited numbers of teachers still available, and also reduce the teaching expenses. This would achieve better understanding between the two closely allied programs and more efficient rehabilitation work.

Commendable efforts have been made by the existing schools and by development of new schools in order to meet the great war-time demand for physical therapists. There is a continuous record of progress in the education of technicians and the needs of the government and civilians can be met providing sufficient number of capable young women become interested in this important field.

References

1. Revision of Essentials of an Acceptable School for Physical Therapy Technicians, in Report of Council on Medical Education and Hospitals, J. A. M. A. **122**:540 (June) 1943.
2. Volunteer Physical Therapy Assistants, Arch. Phys. Therapy **24**:679 (Nov.) 1943.
3. General Culture Tests Developed by the Cooperative Testing Service, Am. Council on Education, 644 Jackson St., Washington, D. C.

A NEW SPECIALTY OF PHYSICAL MEDICINE

The impetus of the war has necessitated training many physicians and surgeons to become specialists in Physical Therapy in order to take charge of departments of physical therapy and occupational therapy in large service hospitals. It is likely that many of these men will continue in this field after the war. At present these specialists are described as "Physical Therapy Physicians," a lengthy term and not strictly accurate, for their practice fortunately is not confined to treatment alone. In a general hospital department a great variety of patients are seen, including both medical and surgical, and all

the subdivisions from dermatology to orthopedics. With this abundant clinical material available, a keen observer may keep abreast of a wide scope of pathologic conditions and acquire diagnostic acumen of as much aid to his colleagues as his knowledge of physical therapeutics. The physical therapist's special skill in electrodiagnosis of nerve injuries is of well-recognized value, especially at present with the increasing numbers of industrial and war injuries. Thoughtful analysis reveals that physical therapy is one of the broadest and most stimulating of the medical specialties. How unfortunate that no entirely suitable name has been found for it. "Rehabilitation" is too limiting and at the same time too indefinite. One might consider a board of "External" or "Parietal" Medicine in contrast to Internal Medicine. The best phrase at present designates the field as that of Physical Medicine, which leaves the physician with at best a cumbersome title. There is a great opportunity for someone to invent a new specialty and aid in the progress of Physical Medicine. Send in your ideas to the ARCHIVES.

CORRESPONDENCE

Re: "Physiology" vs. Physical Therapy

To the Editor: At the last meeting of the Society of Physical Therapy Physicians Dr. Richard Kovács spoke concerning the desirability of a new name for our specialty; something short, concise and yet indicative of the specialty. He also observed that the descriptive term "Physical Therapy Physician" is in itself not adequate as we also use physical agents for diagnosis.

I would like to suggest the term "Physiology" pronounced fi si ko' lo gy. Such a term is similar to those used by the other medical specialties. It indicates our close association to Physics and Physiology and yet is distinctive enough as written and spoken not to be confused with either.

I would suggest that some representative body such as the Society or the Congress establish the following definitions by resolution in much the same way as the American Board of Radiology has established the definitions for Roentgenology and Radiology:

Physiology, fi si ko' lo gy. The science of the diagnostic and therapeutic use of physical agents.

Physicologist, fi si ko' lo gist, A physician spe-

cially trained in the diagnostic and therapeutic use of physical agents.

Physicological, Physicologically, The adjective and adverb forms.

Physical Therapy, Physiotherapy; The art of applying physical agents for therapeutic purposes.

Physical Therapist, Physiotherapist, Physical Therapy Technician; One trained in the art of applying physical agents for therapeutic purposes.

The adoption of the above definitions would help greatly to distinguish between the specially trained physician and the specially trained technician where confusion now exists. This clarification should aid in establishing the medical specialty as a distinct specialty and help in the establishment of an American Board.

If this term is adopted we would then have a Society of Physiologists, an American Congress of Physiology, with their journal *The Archives of Physiology*, a Council on Physiology of the A. M. A., etc.

"Physiology;" say it over a few times, to yourself and out loud. I think you will find that it has a good connotation and a clear, crisp and distinctive sound.

I. F. HUMMON, JR., M.D.



MEDICAL NEWS

Baruch Committee on Physical Medicine

On October 30 the first meeting of the Baruch Committee on Physical Medicine was held in New York. Officers chosen at the session include Dr. Ray Lyman Wilbur, chancellor, Stanford University, Calif., chairman; William T. Sanger, LL.D., president of the Medical College of Virginia, Richmond, vice-chairman, and Dr. Frank H. Krusen, medical director of the School of Physical Medicine, Mayo Clinic, Rochester, Minn., director-secretary. Other members of the committee are Dr. John S. Coulter, Chicago; Dr. Kristian G. Hansson, New York; Dr. Carl R. Comstock, Saratoga Springs, N. Y.; Capt. Charles F. Behrens (MC), U. S. Navy, and Lieut. Col. Benjamin A. Strickland, Jr., M. C., U. S. Army. Nine special committees and their respective chairmen were appointed as follows:

Occupational Therapy, Dr. Hansson.
Poliomyelitis, Dr. Wilbur.
Basic Research, Dr. Sanger.
Clinical Research, Dr. Coulter.
Publicity, Dr. Wilbur.
Hydrology and Health Resorts, Dr. Comstock.
Prevention, Dr. Hansson.
Teaching, Dr. Krusen.
Rehabilitation, Captain Behrens.

The main office for the Baruch Committee on Physical Medicine will be at 597 Madison Avenue, New York. The activities of the various committees will constitute a survey of the field of physical medicine to determine its potentialities, ending, it is proposed, in the establishment of a school of physical therapy for its study and teaching.

The Schick General Hospital

The Schick General Hospital, which was formally opened on October 7, is located 3 miles north of Clinton, Iowa. The hospital has a capacity of 1,514 beds and consists of 103 separate structures. The grounds consist of 89.6 acres of land enclosed by an 8 foot wire fence. There are a chapel, laundry, post exchange, postoffice, ambulance service, recreational facilities and air conditioned operating rooms. Prior to the formal opening of the hospital there were 2,687 patients admitted (Sept. 30, 1943), of whom 674 were operated on. The first patient was admitted on Feb. 15, 1943, and on the same day the first surgical operation was performed, on a soldier from this command. On the day of the formal opening there were 1,175 patients in the hospital, representing every overseas theater of operation. The allotment of nurses is 120 and of enlisted men 512. These men are being trained as operating room, x-ray and laboratory technicians as well as ward attendants. The staff of the Schick General Hospital trained the enlisted personnel of the Eighth

General Hospital before it was sent overseas and is now training the Ninety-First General Hospital. Major Gen. Norman T. Kirk, the Surgeon General, has designated the Schick General Hospital as a Neurosurgical Center. The entire project represents an investment of more than \$6,000,000.

The Schick General Hospital was named in honor of Lieut. William Rhinehart Schick, first army medical officer to be killed in action during the current war. Lieutenant Schick graduated from the University of Illinois College of Medicine in 1939 and was appointed a first lieutenant, medical corps reserve, April 28, 1941. He was killed when the bomber in which he was flying from the United States to Pearl Harbor was shot down during the raid on Pearl Harbor, Dec. 7, 1941.

Col. Dean F. Winn is the commanding officer. First Lieut. Solomon Winokur is chief of the physical therapy section.

Ashburn General Hospital

The U. S. Army Ashburn General Hospital at McKinney, Texas, was formerly dedicated on August 12. Among other speakers on the program were Major Gen. Norman T. Kirk, Surgeon General of the Army; Major Gen. Richard Donovan, commanding general of the Eighth Service Command; Hon. J. H. Snapp, mayor of McKinney; Mr. Hansford Ray, president of the local chamber of commerce, and Hon. Sam Rayburn of Texas, speaker of the U. S. House of Representatives.

The 1,530 bed hospital comprises 110 buildings which occupy a total of 270 acres of land and which are constructed in two parallel rows opening onto a common walkway. The buildings are of tile construction. The hospital was completed at a cost of more than \$3,000,000.

Col. James B. Anderson, M. C., is the commanding officer, and Col. Clifford A. Gray, M. C., the executive officer.

Lieut. Paul M. Kistler is chief of the physical therapy section.

Captain Zankel On Wartime Graduate Medical Program

Captain Harry Zankel, (M.C.), U. S. A., participated in the program which was presented at Will Rogers Field, Oklahoma City, October 6. The program is a part of the Wartime Graduate Medical Meetings organized by and under the auspices of the American Medical Association, The American College of Physicians and The American College of Surgeons, and authorized by the Surgeons General of the Army, Navy, and Public Health Service for the purpose of providing postgraduate instruction

to the professional personnel assigned to the War-time Services who, by reason of their duties in these services, are deprived of the opportunities for such instruction which are usually available to them.

W. M. Scott, Colonel, (M.C.), U. S. A. Commanding Officer, Station Hospital, Will Rogers Field presided. The program in detail follows:

"The Treatment of Burns," *John F. Burton*, M.D., F. A. C. S., American Board of Plastic Surgery, Oklahoma City; "Malaria," *J. Walker Morledge*, M.D., M. R. C. S., England, Oklahoma City; "The Kenny Treatment of Anterior Poliomyelitis," *D. H. O'Donoghue*, M.D., F. A. C. S., American Board of Orthopaedic Surgery, Oklahoma City; "Physical Therapy Procedures," *Harry Zankel*, Captain, (M.C.), U. S. A., Chief of Physiotherapy Section, Borden General Hospital, Chickasha, Okla.; "The Newer Concepts in the Treatment of Venereal Infections," *Charles B. Taylor*, M.D., F. A. C. S., American Urological Association, Professor of Urology, University of Oklahoma School of Medicine; "The Management of Hypertensive Cardiovascular Diseases," *Wann Langston*, M.D., F. A. C. P., American Board of Internal Medicine, Oklahoma City; "Penicillin," *G. F. Wollgast*, Major, (M.C.), U. S. A., Officer in Charge of Penicillin Therapy, McCloskey General Hospital, Temple, Texas; "Traumatic Injuries of the Brain," *Harry Wilkins*, M.D., F. A. C. S., Society of Neurological Surgeons, Oklahoma City.

The members of the Committee, Area No. 16, comprising the states of Arkansas, Kansas, Missouri and Oklahoma are Frank D. Dickson, M.D., Kansas City, Mo., O. P. J. Falk, M.D., St. Louis, Mo., and Henry H. Turner, M.D., Oklahoma City.

Army General Hospital Named for Army Nurse

The War Department announced on October 16 that an army general hospital (the former Chicago Beach Hotel), Chicago, has been named the Ruth M. Gardiner General Hospital in memory of the first army nurse confirmed as killed in a theater of operations in this war. Second Lieutenant Gardiner was a member of the Army Nurse Corps attached to a medical squadron of the Army Air Forces and was killed in a plane crash in July, 1943, at Nanke, Alaska, while serving as an air evacuation nurse. Lieutenant Gardiner graduated with the second class of flight nurses from the School of Air Evacuation, Bowman Field, Ky., on Feb. 18, 1943, and left there for evacuation duty with the Eleventh Air Force in Alaska on April 22.

News Notes From California

J. Wayne McFarland, M.D., Assistant Director of the School of Physical Therapy of the College of Medical Evangelists addressed a gathering of the California State and County public health officers in Sacramento on October 19 and 21 on the "Treatment of Infantile Paralysis as Carried Out in the Los Angeles General Hospital and the

White Memorial Hospital."

George Miley, M.D., Professor of Clinical Pharmacology, Hahnemann Medical College, Philadelphia, has been invited to Los Angeles by the Contagion Section of the Los Angeles General Hospital and the School of Physical Therapy of the College of Medical Evangelists for the purpose of studying the influence of ultraviolet blood irradiation in the acute stage of poliomyelitis. Doctor Miley has arrived and the clinical studies are being carried forward.

Lt. Winifred Ditto, R. N., R. P. T. T., of the Class of '41-'42 of the School of Physical Therapy of the College of Medical Evangelists is chief technician for the 47th General Hospital now in training in Hammond Field Hospital at Modesto, California. It is expected that the 47th General Hospital will soon proceed to one of the war zones.

Women Physicians in the Navy

Dr. Catherine McCorry, senior physician at the Chicago State Hospital for the last twelve years has been sworn in the Naval Medical Corps as a Lieutenant Commander. She has reported for duty at Bethesda, Md.

Praise for H. G. Fischer & Company

Of interest to our readers is the following copy of telegram sent to the H. G. Fischer Company of Chicago:

1943 Oct 2 PM 12 07.

CAQ 57 Govt LG—CT Washington DC 2 1102A

To the Men and Women of H G Fischer & Co—
2335 Wabansia Ave—

Portable x-ray machines such as you manufacture took part in one of the strangest cases of war surgery yet reported when they helped to save the life of a "human bomb" by locating an unexploded 20 mm. anti-aircraft shell lodged in the hip of an American sailor aboard a warship in the South Pacific. Using your type of machine and "working with the greatest of care" a navy doctor and his corpsmen spent several minutes making plates before the shell was located. Then behind the protection of a steel plate an operation was performed to remove the "dud" from the patient who might explode at any minute. You may be proud of producing such essential equipment for the navy.

W. B. YOUNG, Rear Admiral, U. S. N.,
Chief of the Bureau of Supplies and Accounts.

New Course for Physical Therapy Technicians at Duke Hospital

The Council on Medical Education and Hospitals of the American Medical Association at its meeting on November 7, 1943, voted to extend its approval to the school for physical therapy technicians at Duke Hospital, Durham, North Carolina. The training program is nine months in duration.

Clarence A. Neymann Chosen President Illinois Psychiatric Society

Dr. Clarence A. Neymann of Chicago was recently chosen president of the Illinois Psychiatric Society.

Council on Physical Therapy Accepts Germicidal Units

Germicidal units which have been accepted for disinfecting purposes and equipped with General Electric Germicidal Lamps by the Council on Physical Therapy of the American Medical Association are: *Americanaire Ultraviolet* germicidal unit, models UV-30, UV-15; hospital operating room, ward and nursery models; *Burton Ultraviolet Airadiator* germicidal unit, hospital operating room, nursery and ward models; *Radiare*, operating room, ward and nursery models; *U-V-Ray Air Sterilizers*, hospital operating room, ward and nursery models. The Council has also voted to accept the Hanovia Safe-T-Aire Filter Jacket Type Quartz Lamps.

Occupational Therapy

A new curriculum on occupational therapy has been set up by the University of Illinois. Students will spend their first five semesters of study on the Urbana-Champaign campus and four semesters in the college of medicine, Chicago.

The Utilization of Health Resorts for Military Reconstruction

British physicians have found that health resorts are invaluable as centers for reconstruction of those disabled in war. Already in this war United States Army, Navy and Veterans Administration centers for rehabilitation are being established at many health resorts. The United States Army Medical Corps, for example, has established them at the Ashford General Hospital, White Sulphur Springs, W. Va.; the Station Hospital, Camp Carson, Colorado Springs, Colo.; the Fitzsimons General Hospital, Denver; the Army and Navy General Hospital, Hot Springs, Ark.; the Percy Jones General Hospital, Battle Creek, Mich.; the Moore General Hospital at Swannanoa (near Asheville), N. C.; the Station Hospital at Davis-Monthan Airfield, Tucson, Ariz., and the Miami Army Air Force Hospital at Miami, Fla.

The Bureau of Medicine and Surgery of the United States Navy has established hospitals at Asheville, N. C.; Yosemite, Calif.; Glenwood Springs, Colo., and Sun Valley, Idaho.

The Veterans Administration, it is said, is contemplating the establishment of hospitals at such health resorts as Saratoga Springs, N. Y.; Hot Springs, Salt Lake, Utah; Hot Springs, S. D.; Bay Pines, Fla., and Mineral Springs, Texas.

Examples of satisfactory utilization of health resorts for rehabilitation of our wounded soldiers and sailors are to be found at the Army's Ashford General Hospital at White Sulphur Springs, W. Va., and at the Navy's Naval Convalescent Hospital, Glenwood Springs, Colo.

Physical Therapy Technicians Needed for Rehabilitation Program

EDITOR'S NOTE: The following letter, dated November 3, was addressed to the American Registry of Physical Therapy Technicians:

Women with college study in physical education are being offered an unusual professional opportunity to participate in the rehabilitation program for the war wounded through the Army's Physical Therapy training program.

Physical therapy, a treatment of conditions resulting from disease or injury consists of massage, exercise, and treatment with the use of heat, water, and electricity. This profession won recognition in World War I and is being expanded in the present war. Women educated in the basic sciences of physical education are among the few qualified for training in the field of Physical Therapy.

Graduates of schools of physical education or of colleges with major study in physical education are eligible for appointment. Student Physical Therapy Aides will be given 6 months' training in an Army hospital and upon succeeding completion, will be eligible for promotion to the grade of Apprentice Physical Therapy Aide. Eligible also for this position will be persons who have completed a civilian emergency training course in physical therapy approved by the American Medical Association. Qualified persons will be placed on the civil service eligible list and certified to the office of The Surgeon General for assignment to Army hospitals.

Apprentice Physical Therapy Aides who complete their 6 months' apprenticeship in an Army hospital are eligible to apply for appointment as Medical Department Physical Therapy Aide with the relative rank of second lieutenant. These officers will serve wherever needed in this country or overseas for the duration of the war and six months thereafter.

The maximum age limit for appointment as Student Aide is 40; for Apprentice Aide, 44. Applicants must meet physical requirements stated in Army regulations. Students are paid \$420 a year plus \$105 overtime pay; Apprentices, \$1,440 a year plus \$312 overtime pay. Deductions are made for quarters and subsistence.

The enclosed announcements for Physical Therapy Aides list the Army hospitals giving these training courses. The American Medical Association, 535 N. Dearborn Street, Chicago, Illinois, should be consulted for information regarding civilian institutions giving emergency training courses.

In view of the present and inevitable post-war need for trained technicians in the treatment of the war wounded, it is hoped that members of your association may be able to bring this information

to the attention of persons who may be interested in and qualified for this training program. Official announcements are enclosed for distribution, or if you care to send us the names of possible applicants, we will contact them.

By direction of the Commission:

Very respectfully,

WM. C. HULL, Executive Assistant.

United States Civil Service Commission,
Washington, D. C.

The following announcements from the United States Civil Service Commission were enclosed:

The United States Civil Service Commission is accepting applications for Student Physical Therapy Aide, \$420 a year (plus \$105 overtime pay) and Apprentice Physical Therapy Aide, \$1,440 a year (plus \$312 overtime pay). Both salaries given are subject to deductions for quarters and subsistence. The standard Federal workweek of 48 hours includes 8 hours of overtime. For the positions described in this announcement, the increase in compensation for overtime is shown. Applications will be accepted from women only.

1. Training for Military Service.—The number of female applicants to be appointed to the positions of Student Physical Therapy Aide and Apprentice Physical Therapy Aide will be determined by the needs of Army hospitals.

Appointees as Student Physical Therapy Aides are given a condensed 6 months' course of training in an Army hospital. Upon the successful completion of this course, students may be promoted to the grade of Apprentice Physical Therapy Aide.

Persons who have successfully completed in civilian institutions a full condensed emergency training course in physical therapy approved by the American Medical Association will also be considered for the position of Apprentice Physical Therapy Aide, and if qualified will be placed on the Civil Service eligible list. The Office of the Surgeon General will assign, from the Civil Service eligible list, Apprentice Physical Therapy Aides to Army hospitals selected for this training. If possible, assignments will be made to the Army hospital which the individual has indicated in the application as her preference.

Appointments in the Army.—Upon the successful completion of 6 months' training in an Army hospital, Apprentice Physical Therapy Aides who meet all other requirements are eligible to apply for appointment in the Army as Medical Department Physical Therapy Aide with the relative rank of second lieutenant. Individuals accepting such appointments will be required to serve wherever needed in this country or overseas for the duration of the war and 6 months thereafter unless their service is terminated sooner.

The acceptance of an appointment to a training position as Student Physical Therapy Aide or

as Apprentice Physical Therapy Aide is an indication that the applicant is fully aware of an obligation to accept, upon the successful completion of the training courses, an appointment as Medical Department Physical Therapy Aide with the relative rank of second lieutenant in the Army, if such appointment is offered.

Civilian Appointments.—Individuals who successfully complete 6 months of training as Apprentice Physical Therapy Aides, but who are not appointed to military service, will be eligible for appointment to a civil service position of Physical Therapy Aide at \$1,800 a year in Federal hospitals as such vacancies occur.

II. Minimum Qualifications.—A. Student Physical Therapy Aide.—Applications for positions as Student Physical Therapy Aide must *either*

1. Have completed a full 4-year course leading to a bachelor's degree, with major study in physical education, in an accredited school of physical education, or in a university or college of recognized standing; OR

2. Be enrolled in an accredited school of physical education or in a university or college of recognized standing in a course leading to a bachelor's degree with major study in physical education, and must expect to complete such course within 9 months of the date of receipt of application. Provisional appointment may be made prior to completion of the course, but, before entrance upon duty, proof of the completion of the course must be submitted directly to the War Department.

B. Apprentice Physical Therapy Aide.—Applicants for positions as Apprentice Physical Therapy Aide must *either*

1. Have successfully completed a full emergency training course in physical therapy approved by the American Medical Association; OR

2. Now be enrolled in an emergency training course in physical therapy meeting the standards established for the duration of the war by the American Medical Association and must expect to complete their course within 9 months of the date of receipt of application. Provisional appointment may be made prior to completion of the course, but, before entrance upon duty, proof of the completion of the course must be submitted directly to the War Department.

III. Location of Training Courses for Appointees.—Training courses for Student Physical Therapy Aides are conducted by the Medical Department of the Army and are located at Walter Reed General Hospital, Washington, D. C.; Fitzsimons General Hospital, Denver, Colo.; O'Reilly General Hospital, Springfield, Mo.; Army and Navy General Hospital, Hot Springs, Ark.; Brooke General Hospital, Fort Sam Houston, Tex.; and at Station Hospital, Fort Huachuca, Ariz.

Training for Apprentice Physical Therapy Aides is available in Army hospitals within the con-

tinental limits of the United States as selected by the Surgeon General.

Applications are not desired from persons engaged on war work unless the position applied for requires the use of higher skills than the worker is using in his present employment.

This announcement issued October 18, 1943 cancels and supersedes Announcement No. 259, issued September 1, 1942.

General Information

1. Applications will be accepted until the needs of the service have been met.

2. Applicants must be citizens of or owe allegiance to the United States. Foreign-born applicants must furnish proof of citizenship.

3. Applicants successfully completing the training courses as Apprentice Physical Therapy Aides will be expected to apply for appointment to the position of Medical Department Physical Therapy Aide in the Army, and therefore all applicants for Student Physical Therapy Aide and Apprentice Physical Therapy Aide must meet certain physical and age requirements which are prescribed in Army regulations.

Applicants for the position of Student Physical Therapy Aide must not have passed their fortieth birthday, and for the position of Apprentice Physical Therapy Aide must not have passed their forty-fourth birthday. (*These age limits will not be waived in any case.*)

Applicants must be not less than 60 inches in height without shoes and weigh not less than 105 pounds when clad only in a surgical sheet or gown.

Applicants must be physically capable of performing the duties of the position and be free from such defects or diseases as would constitute employment hazards to themselves or would endanger their fellow employees or others.

If selected, the applicant will obtain a report of a preliminary physical examination by a licensed doctor of medicine or Federal Medical Officer prior to appointment, and will forward this to the Office of the Surgeon General for review. The final physical examination will be made by the board of medical officers after arrival of the applicant at the station of first assignment. If upon reporting at the place of assignment an applicant is found ineligible because of physical defects, she cannot be appointed and no part of her expenses for returning home can be borne by the Government.

4. Married applicants who meet all other requirements are eligible for appointment, provided that they agree to accept assignment without reservations. It is not expected that Student or Apprentice Physical Therapy Aides will marry during the period of training.

5. No written test is required. Applicants' qualifications will be judged from a review of sworn statements as to their education and training, and on corroborative evidence secured by the Commission.

6. Appointments will be War Service appointments. Such appointments generally will be for the duration of the war and in no case will extend more than 6 months beyond the end of the war.

7. All salaries are subject to a deduction of 5 per cent for retirement purposes.

8. Appointments in the Federal service are made in accordance with War Manpower Commission policies, directives, regulations, and employment stabilization plans. This means generally that persons employed in certain activities or occupations may be required to obtain statements of availability from their employers or from the United States Employment Service before they can be appointed. An offer of Federal appointments will be accompanied by instructions as to what steps the person must take to secure necessary clearance. Statements of availability should not be secured until an offer of appointment is received.

How to Apply

1. Applicants must file the following forms with the United States Civil Service Commission at Washington 25, D. C.:

- a. Application Form 57. *Caution:* Be sure that your courses in physical education and physical therapy, and the extent of your college education are clearly shown on your application form.
- b. Application Card, Form 4006-ABC.
- c. Form 14 and proof of honorable discharge, if applicants desire to claim preference because of military or naval service.

2. The necessary forms may be obtained from the *Secretary, Board of United States Civil Service Examiners*, at any first- or second-class post office, except in regional headquarters' cities, listed below, where the forms must be obtained from the United States Civil Service Regional Office. The forms may also be obtained from the United States Civil Service Commission, Washington 25, D. C. The title of the examination desired should be stated.

- Atlanta 3, Ga., New Post Office Building.
- Boston 9, Mass., Post Office and Courthouse Building.
- Chicago 7, Ill., New Post Office Building.
- Cincinnati 2, Ohio, Post Office and Courthouse.
- Dallas 1, Tex., U. S. Civil Service Commission Building, 210 South Harwood Street.
- Denver 2, Colo., New Customhouse.
- New York 14, N. Y., Federal Building, Christopher Street.
- Philadelphia 6, Pa., Customhouse, Second and Chestnut Streets.
- St. Louis 1, Mo., New Federal Building.
- St. Paul 1, Minn., Post Office and Customhouse.
- San Francisco 2, Calif., Federal Office Building.

Seattle 1, Wash., Post Office Building.
Winston-Salem 3, N. C., Nissen Building.
Honolulu, T. H., Federal Building.
Balboa Heights, C. Z., Secretary, Board of
United States Civil Service Examiners.
San Juan, P. R., Chairman, Puerto Rican Civil
Service Commission.

Fraud Order Issued—Holder's H. F. Condensator Company, Holder's Research Laboratories, "W. E. Holder, M.D.," "Dr. D. O. Crowe, D.M.T." and Others

These concerns and persons, whose addresses were given variously as Detroit and Windsor, Ontario, Canada, promoted through the mails a device called at different times "Holder's H. F. Condensator," "Holder's Ultra-Short Wave Condensator" and "Holder's Ultra-Short Wave H. F. Condensator." The moving spirit in the scheme was a William E. Holder, who formerly had advertised and sold through the mails a rubber chair cushion containing an electrical heating unit represented as a curative agency for a large number of serious diseases and other ailments. The operation of that scheme through the mails resulted in the issuance of a Post Office fraud order on Dec. 23, 1938, which closed the mails to Holder and others. Thereafter, it appears, Holder deemed Canada a more propitious place for his activities and set up his new enterprise in Windsor, later opening an agency in Detroit which was run by D. O. Crowe. Holder promoted his "condensator" in certain publications circulating through the mails.

There were numerous testimonials and statements alleged to have come from physicians reporting the supposed cures of a wide variety of disorders, such as blood poisoning, paresis, infantile paralysis, cancer, including "inoperable stomach cancer," liver tumor, epilepsy, diabetes, pyorrhea, "black widow spider bite," varicose veins, cirrhosis of the liver, exophthalmic goiter, mental diseases, obesity, impotence, high blood pressure, and many others. The only condition which the literature admitted "Holder's Therapy" would not remedy was "abnormality of spine"—whatever that may be. The device sold for \$365 and, though Holder contended that it was distributed only to physicians, the Post

Office inspector declared that test cases that he had conducted had shown that anyone who would send the required amount would be supplied with a "condensator." On Aug. 24, 1942, the Post Office Department directed the persons and concerns in question to show cause on September 31 of that year why a fraud order should not be issued against them. At the hearing, which had been postponed to October 7, an attorney appeared for the respondents. A qualified electrical and radio engineer who had spent many years in examining electrical devices testified for the government that in going over the "condensator" he had employed the best scientific instruments and followed well recognized testing procedures and that, though this device was represented in the advertising to produce "100,000,000 oscillations per second," the examination at the National Bureau of Standards showed that it actually produced not more than 250,000 oscillations or kilocycles. A qualified physician specializing in physical therapy testified for the government that the use of the "condensator" would not cure "so-called incurables" suffering from any of the numerous disorders listed in the advertising and that even if heat is indicated in the treatment of any of these, the amount of heat given off by the "condensator" would not penetrate deeply enough to produce any significant results. He testified further that some of the diseases in question require surgery, x-ray and other types of therapy for their proper treatment. It was brought out also that William E. Holder, originator and principal promoter of the device, is not a physician, had never attended any electrical school and has no scientific or college education of any sort, and that in treating persons at his residence in Windsor, Ontario, he takes at face value their statements about their physical condition; that he has had no qualified physicians association with him, was deported from Chicago to Canada several years ago by the emigration authorities because of his promotion of the electric rubber chair cushion scheme previously mentioned, and at present is barred from returning to the United States. He is a British subject born in England in 1868. Because of his latest mail order enterprise, which the government charged was a scheme to swindle the public, a fraud order was issued Dec. 22, 1942, against him, D. O. Crowe and other names under which their operations were conducted.—[Abst. J. A. M. A. 123:303 (Oct. 2) 1943.]



BOOK REVIEWS

VICTORIES OF ARMY MEDICINE. By *Edgar Erskine Hume*, Colonel, Medical Corps, United States Army. Cloth. Pp. 250, illustrated. Price, \$3.00. Philadelphia: J. B. Lippincott Company, 1943.

This is really an interesting history of the Medical Department of our Army by a noted officer of that corps. Colonel Hume has had a distinguished career in the Army. After studying at Johns Hopkins and in medical schools abroad he entered the Army. In 1917 he became Executive Officer of the Division of Sanitation in Surgeon General Gorgas' office. Later in the First World War he commanded the American Army hospitals in Italy, the youngest officer in the Army to hold such a position. As American Red Cross Commissioner after the war he had charge of the military and civil relief in the Balkans and Eastern Europe, directing the successful campaign against typhus fever. For this work he received the Distinguished Service Medal and decorations from many European countries. Since that time Colonel Hume has written important medical and historical works, earned advanced degrees from Harvard and Massachusetts Institute of Technology, and served as Librarian of the Army Medical Library, the largest medical library in the world. He has been decorated by thirty-five countries.

This is a book to make every physician in the United States proud of the Army Medical Corps. Colonel Hume tells the story of a long succession of thrilling achievements in fields of medicine and science of the Army Medical Corps. That these have been great can be told by Dr. William Henry Welch who said: "I have been asked on more than one occasion what have been the really great contributions of this country to medical knowledge. I have given the subject some thought and think that four should be named: (1) the discovery of anesthesia; (2) the discovery of insect transmission of disease; (3) the development of the modern public health laboratory in all that the term implies, and (4) the Army Medical Library and its Index Catalogue."

The author relates the stories of Walter Reed's proof that yellow fever is transmitted and spread by the mosquito; that the Army was the first to fight smallpox through vaccination during the War of 1812 and that William Beaumont, an army physician, gave the world more complete and accurate information about digestion than had been learned through all preceding history. It is shown that in the War for Independence that Church was succeeded in November, 1776 by Dr. John Morgan, the brilliant Philadelphia physician and a founder of what is now the University of Pennsylvania, America's oldest medical school. It is of interest to physical therapy physicians that an Army physi-

cian added valuable work in the use of ultraviolet light.

In the field of science it will surprise most physicians that the Army medical department originated the United States Weather Bureau; that Surgeon General Benjamin Rush was a pioneer anthropologist and that some of the work of the medical officers in the history of ornithology has been unsurpassed. This book is highly recommended. It should be read by every physician who has been in or who is in the medical service as well as by everyone who is interested in medical history.

BODY POISE. By *Walter Truslow*, M.D., F.A.C.A., Consulting Orthopedic Surgeon to the Brooklyn, Long Island College Hospital and other hospitals; former Lecturer on Orthopedic Surgery, Long Island Medical College and on Anatomy and Kinesiology, New York University, New York School of Physical Education, and Y. M. C. A. Summer School, Silver Bay, N. Y. Cloth. Pp. 352, with 97 illustrations. Price, \$4.50. First Edition. Baltimore: The Williams & Wilkins Company, 1943.

This is a book on a subject that is beginning to gain the attention it merits. The subject matter which is well presented is divided broadly into three divisions: First, basic anatomy and action of muscles; second, pathologic deviations from the normal, involving the mechanism of posture and treatment; third, body poise in games and sports. Because the author has presented the action of muscles in the orthodox manner some students will be in violent disagreement with him. The text is well illustrated throughout. The various therapeutic exercises are clearly shown by excellent cuts. It is a practical book and shows simple means of taking measurements so that the progress of therapy can be visualized. The writer has made an attempt to evaluate the relative value of corrective exercise to the entire treatment. The exercises require a minimum of apparatus so that once the patient has had the initial training, the exercises may be continued at home. The accuracy of performance is stressed by Truslow. To those particularly interested in physical education part three on the kinesiology of sports and games will be of much interest. He points out the sports and games which he believes tend toward uneven and asymmetrical development and gives suggestions for counteracting these bad trends. This volume should be in the library of every physical therapy technician. It will be of value to the general practitioner, but especially so to the physicians in the field of physical medicine.

PRIMER ON FRACTURES. By the Special Exhibit Committee on Fractures of the American Medical Association: *Kellogg Speed, Frank D. Dickson, and Walter E. Lee*. Fifth Edition. Cloth. Pp. 119. Price, \$1.00. Chicago: American Medical Association, 1943.

The popularity of this short outline of fracture treatment is evidenced by the fact that five editions have appeared in thirteen years. Practical aspects of first aid are included as well as a simplified presentation of accepted methods for dealing with common varieties of fractures. The illustrations taken from exhibits are drawings clearly emphasizing the points for which they are designed without confusing detail. The role of physical therapy is very briefly mentioned, active motion, gentle massage and mild heat being recommended in general terms. This volume is attractive primarily for students learning the principles of fracture treatment. It can not serve as a reference for the surgeon or physical therapist desiring specialized information.

JOURNEY AMONG WARRIORS. By *Eve Curie*. Cloth. Pp. 501. Price, \$3.50. New York: Doubleday, Doran & Co., Inc., 1943.

This is a book of interest to everyone using physical agents for three reasons. First the author is the daughter of Marie Sklodowska Curie, a Polish-French physicist and chemist and Pierre Curie, a French physicist who collaborated in researches on radioactivity which resulted in their discovery of radium. Second, it is of interest because her report on her far-flung journey among warriors is one of the greatest and most inspiring of all books on our tortured world. Thirdly, it is a book for those of us who want to increase our sense of participation in this great conflict and for those who would understand the people who fight our battles—the Russian peasant, the Polish exile, the Free Frenchman, the Chinese coolie and the ordinary citizens who are behind the man behind the gun.

A few quotations show how graphically she presents her experience. In Russia she got to the zone that had been reconquered in the last few days. "Right and left of us, on both sides of the road, there were hundreds and hundreds of Germans freshly killed, lying in the snow mixed up with dead horses and disabled guns. The falling snow gradually shrouded them all. . . . The Nazis had retreated too fast to bury these soldiers—yet they had time to do something else: to mine many of the stiff frozen corpses, so that the Russians, when burying them, should be killed by the explosions.

"I was not moved after seeing the burned houses in the villages, and the gallows where peasants had been hanged, it was not easy to be moved by the corpses of Nazi soldiers."

The author visited China just after we lost the Burma road to the Japs. Before leaving Neikiang a force of beggars attacked their party. "They were mostly children — wretched, brutal kids appallingly dirty, who bore within them all the ills of the

world and whose skins were covered with eczema. The most determined of the lot was a small girl, perhaps eleven years of age, whose hardened face was tragically old with suffering and revolt and an elderly man half blind, with eyes that looked molded."

This is a book that should be read by everyone. It is a war book with the emphasis not on grand strategy or problems of state, but on the people whose blood, sweat and tears are flowing for the cause of freedom.

A MANUAL OF PULMONARY TUBERCULOSIS (Part I) and AN ATLAS OF THORACIC ROENTGENOLOGY (Part II). By *David O. N. Lindberg, M.D., F.A.C.P.*, Lecturer on Tuberculosis, State University of Iowa, College of Medicine; Director of Roentgenology, State Sanatorium, Iowa. Cloth. Pp. 219, with 189 illustrations including 145 plates. Price, \$6.50. Springfield, Ill.: Charles C. Thomas, 1943.

Part one of this volume presents concisely and diagrammatically the important points in diagnosis of pulmonary tuberculosis, emphasizing roentgen ray technic and interpretation. The chapter on general management gives a practical outline for treatment of patients in the different stages of activity of disease with a remarkable degree of detail for so little space. Surgical procedures frequently used are briefly described with summaries of the indications, benefits and hazards. The most distinctive feature of the book is the atlas of 145 excellent reproductions of roentgenograms illustrating different stages of pulmonary tuberculosis and the effect of treatment by rest, pneumothorax and other procedures. Plates are also shown of various conditions to be considered in differential diagnosis. Although not enough clinical and pathologic data are included to make this in any sense a textbook on pulmonary tuberculosis, it should be of considerable value as a reference for physicians occasionally called on to treat tuberculosis and for medical students.

DISCUSSION GROUPS. TWENTIETH ANNUAL CONFERENCE OF THE AMERICAN PHYSIOTHERAPY ASSOCIATION. A Transcription. Paper. Pp. 193. California: Stanford University Press, 1941.

Since the advent of the Kenny concept as related to the treatment of infantile paralysis, much attention has been focused on a closer study of the possible causative factors involved in the production of muscular spasm. Likewise we have become more muscle-action minded and our scientific curiosity is directed in channels of better understanding of applied anatomy or its synonym kinesiology. We are now much more concerned with group action rather than individual muscle action. For those who find interest in these subjects, the above entitled little volume of 193 pages should be of unusual interest.

The material covers the proceedings of round table panel discussions, sponsored by the American Physiotherapy Association, June, 1942 and includes consideration of signs, symptoms and treat-

ment of infantile paralysis, cerebral palsy and war injuries as related to peripheral nerve injuries.

The various consultants and panel leaders are well known teachers and practitioners in the field of anatomy, physiology, physical therapy and occupational therapy and this reviewer's reaction, after reading the volume, is that they did a very creditable job. It is worth while reading and recommended especially to orthopedic surgeons and physical therapy technicians.

A HANDBOOK OF MEDICAL LIBRARY PRACTICE. INCLUDING ANNOTATED BIBLIOGRAPHICAL GUIDES TO THE LITERATURE AND HISTORY OF THE MEDICAL AND ALLIED SCIENCES. Based on a Preliminary Manuscript by *M. Irene Jones*. Compiled by a Committee of the Medical Library Association. *Janet Doe*, Editor. Cloth. Pp. 610. Price, \$5.00. Chicago: American Library Association, 1943.

The present volume begins by surveying the growth and the present status of medical libraries, describes the various types and their differing requirements and discusses the qualifications of the medical librarian. A particularly helpful contribution is the review of the various classification schemes now in use by medical libraries. Not only librarians but readers as well may make use of this book: physicians interested in the history of medicine; medical authors preparing to write papers; or students anxious to learn the use of the library and the wealth of their profession's literature. Among the interesting chapters attention is called to "Pamphlets and Pictures, Maps and Microfilm" in which there is found much practical and detailed information as to how to secure many different kinds of motion pictures, how to go about the preparation of lantern slides and how to make use of microfilms. This handbook should be a boon companion to the person who must work out these details which constitute a handicap to the many busy teachers and students who would probably write or lecture more or improve their teaching if they were more familiar with these aids. The book is highly recommended to all those who want to know more about the medical library as well as to those already familiar with the medical library.

MANUAL OF DERMATOLOGY. Issued under the Auspices of the Committee on Medicine of the Division of Medical Sciences of the National Research Council. By *Donald M. Pillsbury*, M.D.; *Marion B. Sulzberger*, M.D., and *Clarence S. Livingood*, M.D. Cloth. Pp. 421, illustrated. Price, \$2.00. Philadelphia: W. B. Saunders Co., 1942.

This manual sets forth briefly and simply, the management of dermatoses encountered in the army forces. Since the patients treated are in most cases adult males emphasis has been placed on the common skin diseases affecting persons of this age-sex group. No rarities, no obscure diseases nor any untried methods of treatment are discussed. The special diagnostic and laboratory procedures described include only those which are relatively simple and useful in practice. The authors state that from their knowledge it can be conservatively stated that

some 20 to 25 per cent of all diseases in the armed forces are the object of dermatosyphilologic management. By and large it has been found that the dermatologic problems of the Army and Navy are almost identical. Some slight differences exist, such as the higher incidence of plant dermatitis in the Army or the fact that the sailor who presents an acute eruption usually has a sick bay available where medicated baths can be given, wet dressings applied, etc., while the soldier who is with his regiment cannot, as a rule, be given medicated baths or have wet compresses applied. This book should be in the library of every physician in the armed forces.

PHYSIOLOGY OF THE NERVOUS SYSTEM. By *John Farquhar Fulton*, M.A., D. Phil., D. Sc. (Oxon), S.B., M.D. (Harv.), Sterling Professor of Physiology, Yale University. Formerly Fellow of Magdalen College, Oxford. Second Edition. Cloth. Pp. 589. Price, \$9.00. New York and London: Oxford University Press, 1943.

This valuable volume should be read by every physician who is dealing with war casualties. While the book was written primarily as a text for physiologists and those interested in clinical neurology its field of usefulness is such that the progressive clinician can profit by its study. In this second volume the author has integrated the vital research of the past five years into his previous work. The biochemical approach to the physiology of the nervous system has been notably advanced during the past five years and has served to throw light on many of the injuries and stresses peculiar to war. The book is well illustrated and contains an excellent bibliography. This text is highly recommended to all physical therapists.

ANNUAL REVIEW OF PHYSIOLOGY. Edited by *James Murray Luck*, Ph.D., Associate Professor of Biochemistry, Stanford University, Editor, and *Victor E. Hall*, M.D., Associate Professor of physiology, Stanford University, Associate Editor, and twenty-six contributors of reviews. Cloth. Vol. 5. Pp. 612. No illustrations. Price, \$5.00. Stanford University Post Office, California. Annual Reviews, Incorporated, 1943.

This volume of the *Annual Review of Physiology* is up to its usual standard of excellence. Twenty-two different subjects are reviewed encompassing, fairly completely, the field of physiology. Each subject is accompanied by an excellent bibliography covering both American and foreign literature, in so far as the latter is available. The world has been in a state of turmoil during the past four years, nevertheless, this work is evidence that a considerable amount of physiologic research has been done. Physiology is the basis of medicine, and the medical man who would do scientific work must keep himself up to date in this field.

For those interested in physical medicine, certain chapters in the *Annual Review of Physiology* hold special interest. The first chapter, by Blum on the physiologic and pathologic effects of ultra-

violet radiation, deals largely with the absorption of ultraviolet and its effects on the skin. The chapter on muscle by Fischer is of great fundamental importance to those engaged in muscle reeducation, since anyone doing this work should understand the underlying muscle physiology. Although there is no direct reference to physical medicine in the chapter on the physiology of bone, here again a knowledge of the healing process in fractures is essential to those giving post-fracture care. Another pertinent discussion is that on temperature regulation which contains a section on hypothermia.

Tucked away in various chapters of the volume are references to the effect of physical measures on various physiologic processes, for example, the effect of heat and cold on lymph flow, the effect of diathermy on intestinal motility and the effects of galvanic and faradic stimulation in peripheral nerve lesions.

The last chapter in the book is a comprehensive review by Bliss and Cattell on the important subject of biologic assay. The volume is indexed by both authors and subjects. It is recommended without reserve to all of those interested in the recent advances in physiology.

HOW TO PREPARE FOR MILITARY FITNESS. By *Lt. Col. François D'Eliscu*. Illustrated by *Stephen J. Voorhies*. Cloth. Pp. 216, with 161 illustrations. Price, \$1.96. New York: W. W. Norton & Co., Inc., 1943.

This book deals with the training of large groups of men in a toughening and coordinating program to fit them for all types of combat duty. The subjects covered range all the way from physical testing, calisthenics, boxing and wrestling, through and including Judo, single and dual combatives and aquatic testing and life saving. The technic of the construction and use of obstacle courses is well covered as are such less familiar subjects as the art of wall scaling and tree climbing. One of the most striking features of the book is the forthright manner in which the author depicts the most effective ways in which to "black out" or "kill" one's antagonist. In fact, the whole tenor of the volume is to the effect that in this war one must kill or be killed hence the emphasis on alertness, conditioning, and perfection of the art of using one's body to maim or destroy the enemy. The text is brief and very much to the point, the illustrations are well conceived and of great help in clarifying the subject matter. While the field of usefulness for this volume is somewhat limited, it should prove to be valuable reading for anyone

interested in physical education and physical training. Even to the casual reader there is much that is of interest. In the chapters devoted to Savate (or the art of kicking) and Judo one is brought face to face with the less pleasant aspects of hand-to-hand combat—the text at times becoming almost gory. The stout hearted reader will derive much benefit from the book and all who read it will be thankful that the author is on our side.

GOUT. By *John H. Talbott*, M.D., Associate in Medicine, Harvard University, Boston. Edited by *Henry A. Christian*, A.M., M.D., LL.D., Clinical Professor of Medicine, Tufts College Medical School, Boston. (Reprinted from Oxford Loose-Leaf Medicine, with the same page numbers as in that work). Cloth. Price, \$2.50. Pp. 79-134, with 56 illustrations. New York, London and Toronto; Oxford University Press, 1943.

The subject matter found in this monograph is thoroughly and comprehensively discussed. It should be of particular value to practitioners because gout makes up 5 per cent of patients who come to arthritis clinics. Much attention is given to metabolic phenomena and the morbid anatomy. An excellent clinical description of the acute and chronic phases of gout is given. The method of treatment is well presented. The book should be a valuable addition to the library of any physician, but particularly to those interested in the important problem of the management of the various types of subacute and chronic arthritis. The work is highly recommended.

YOUR ARTHRITIS: WHAT YOU CAN DO ABOUT IT. By *Alfred E. Phelps*, M.D. With an introduction by *R. Garfield Snyder*, M.D. Cloth. Price, \$2.00. Pp. 192, with 192 illustrations by *James MacDonald*. New York: William Morrow & Company, 1943.

Numerous books have been written for the patient by physicians in special fields such as diabetes and tuberculosis. This book is dedicated to the arthritic patient to give him a better insight or understanding of the chronic disease, arthritis. Physicians, because of the limited time which can be spent with the patient frequently are unable to explain all of the essential points that the patient should know about arthritis. The author discusses among other points, the prevalence of arthritis, different names for arthritis, causative factors, gout, posture and gait, the importance of rest, diet and cooperation of the patient with the physician. This is a safe book for the physician to recommend to the arthritic patient.



PHYSICAL THERAPY ABSTRACTS

The Use of Prostigmine in the Treatment of Poliomyelitis. Herman Kabat, and Miland E. Knapp.

J. A. M. A. 122:989 (Aug. 7) 1943.

In recent years radical changes in the therapy of poliomyelitis have been advocated which have stimulated reinvestigation of the pathologic physiology of the disease. "Muscle spasm" and "incoordination" have been shown to be frequent and prominent symptoms of poliomyelitis.

An analysis of available sections of the spinal cord from 78 patients with poliomyelitis who died in the acute stage of the disease has revealed that inflammation about the internuncial neurons in the gray matter of the spinal cord occurred in almost every case and that injury to internuncial neurons appeared to be prominent in many cases. On the other hand, little or no injury to anterior horn cells was observed in about 40 per cent of the cases, while the other 60 per cent showed more or less pronounced destruction of the large motor neurons.

The effects of prostigmine on muscle function in poliomyelitis have been studied in a series of 24 patients ranging in age from two to forty-six years. The time from the onset of paralysis varied from three weeks to seventeen months.

Prostigmine decreases skeletal muscle hyper-tonus and proprioceptive reflex hyperirritability ("muscle spasm") in patients with poliomyelitis. It also reduces "incoordination." These effects may be evident one hour after subcutaneous administration of the drug. These actions of prostigmine apparently depend on alteration of function of synapses in the spinal cord and are not antagonized by atropine.

Prostigmine has been given a preliminary trial as an adjunct in the treatment of poliomyelitis. In a series of 20 patients, most of whom were in the subacute stage of the disease, the results have been encouraging. The drug significantly increased the range of passive motion, decreased or eliminated deformities in some instances by relaxation of hypertonus and in some cases improved active motion. In a number of instances muscle spasm has shown more rapid improvement when prostigmine was added to the Kenny routine. In a majority of cases the drug appeared to accelerate recovery.

War-Time Decline of Acute Rheumatism. J. Alison Glover.

Lancet 245:51 (July 10) 1943.

Generally the health of the nation, despite increases in certain diseases has well withstood the strain of three and a half years of war and seems almost better than usual. Even against this back-

ground, the behavior of acute rheumatism is outstanding. While its severity and (less certainly) its incidence had been steadily declining for many years before the war, yet since the war its gradual decline has greatly accelerated—its death rate has been halved, inpatients are much reduced in number and a general impression has been received of lessened incidence and clinical severity alike of rheumatic fever, carditis, and chorea.

The decrease in poverty caused by abundant employment during war-time, the greatly increased provision of milk for all children and of solid meals for school children, the long "changes of air" due to evacuation which have tended to decrease urbanization, these are all possible factors in the suddenly accelerating decline. The first is probably the most important of the three.

The Sacro-Iliac Joint and Pain of Sciatic Radiation. Charles D. Hershey.

J. A. M. A. 122:983 (Aug. 7) 1943.

The cause of pain of sciatic radiation has long been a subject of investigation, and the causative factors advanced for this condition are legion. The anterior sacro-iliac regions of 64 embalmed bodies were dissected. The relation of the lumbosacral trunk to the sacro-iliac joint was determined and the degree of arthritic lipping of the joint was noted and classified as to severity. From the study it was shown: (1) the lumbosacral trunk was in direct contact with the sacro-iliac joint at the point at which it traverses the joint in its lower one-third; (2) the upper portion of the origin of the piriformis muscle was found to lie medial to the lumbosacral trunk and never to lie between the trunk and the joint; (3) hypertrophic arthritis in the form of severe spur formation on the anterior line of the sacro-iliac joint was found to be present in 25 per cent of the bodies that were studied. Most of these were considered capable of producing direct irritation of the lumbosacral trunk; (4) hypertrophic sacro-iliac arthritis is more frequently found in the older age groups but is often encountered in younger persons, and (5) hypertrophic lipping of the joint in the lower one-third where the lumbosacral trunk crosses it can be determined readily by anteroposterior roentgenograms of the pelvis.

Effects of Infra-Red Irradiation on the Tissues of the Rabbit. R. H. Rigdon; Frances Ewing, and Adair Tate.

Am. J. Path. 19:517 (May) 1943.

Briefly the authors describe the pathologic changes that occur in the rabbit following the

application of infra-red irradiation to the skin. These are characterized by extensive necrosis and ulceration. Lesions are present in the skin, abdominal muscles, stomach, intestine, spleen, liver, lungs, brain, eyes and bone marrow.

Brain Metabolism During Electronarcosis. A. van Harreveld; D. B. Tyler, and C. A. G. Wiersma.

Am. J. Physiol. 139:171 (June 1) 1943.

The authors in the summary stated that the influence of electronarcosis on the blood flow through the brain had been investigated. Electronarcosis had been found to have a tendency to increase the flow. In other experiments in which no general narcotic was applied, the effect of electronarcosis on the A-V differences of the brain was examined. This effect appeared to be a depression of the A-V differences. A comparison of the changes of the A-V differences before, during and after electronarcosis, with the course of the blood flow during these same periods, showed that the former are mainly reflections of the latter. It can be concluded that electronarcosis does not cause large changes in the brain metabolism. Electronarcosis differs greatly from chemical narcosis in its effect on the oxygen consumption of the central nervous system.

Electric Shock Treatment of Mental Disorders. Hans Lowenbach.

North Carolina M. J. 4:123 (April) 1943.

Electric shock treatment, in its typical and "confusional" forms, is a method of treating human beings ill with schizophrenia, paranoia, depressions and excitements of different categories, and anxiety states by convulsions electrically induced. If properly administered, it has few immediate dangers. It is convenient to the patient, who feels nothing of the treatment and has a complete amnesia for each convulsion and for some time before and afterward. It is easy for the physician to give.

Electric shock treatment, like other previous forms of convulsive therapy, is empirical and the mode of action is as unknown as is the cause of the disease treated. In the vernacular, "we treat something we do not know what it is, with something we do not know what it does." Our justification is the great number of patients restored to health and happiness, who formerly were relieved either of a long period of helpless waiting, or not at all.

Treatment of Pityriasis Rosea. George W. Binkley.

Ohio State M. J. 39:344 (April) 1943.

External treatment is of two types: (1) irradiation therapy with one of the sources of ultraviolet or sunlight, (2) local applications adjusted

to the type and stage of the cutaneous reaction. Ultraviolet therapy can be given with a cold quartz lamp or the hot quartz mercury arc lamp. The dosage is an erythema given every four to seven days to all skin areas involved. In an early case it is a good plan to anticipate that the eruption will extend to the elbow and to the knees. Thus, the torso, and upper and lower extremities should receive irradiation at the first visit.

The erythema time of ultraviolet given by the ordinary or hot quartz mercury arc lamp will vary with the following factors: the type of apparatus, the strength and age of the burner, the distance from the skin. The susceptibility of individuals varies. Brunettes as a rule tolerate ultraviolet and sun better than blonds.

Principles of Exercise Therapy. Ernest A. Nicoll.

Brit. M. J. 4302:747 (June 19) 1943.

Remedial exercises have long been recognized as the basis of functional recovery in fractures and other injuries of the locomotor system. The success of any accident service depends on its organization for the application of therapeutic exercise to all cases and at all stages. In the past, convalescence from certain conditions has been entirely negative and loosely supervised, but efforts are now being made by the Ministry of Health to substitute a more positive approach on the lines of the aftercare organization in accident services.

Physicians and surgeons must appreciate and understand the basic principles of exercise therapy to be able to direct its application and to supervise intelligently the work of their technical assistants—the physical therapist, the occupational therapist and the gymnast.

The basic principles of exercise therapy include the following five requirements: (1) Exercises must be both local and general. (2) They must be administered with due regard to correct dosage. This is variable from case to case and at different stages in the same case. (3) They must be rhythmic in character. (4) They must be progressive in range, power and time. (5) They must be variable in form, the chief forms being gymnastic, occupational and recreational.

The Kenny Method for the Treatment of Poliomyelitis. C. J. Frankel.

Mil. Surgeon 93:60 (July) 1943.

The young adult of military age is not immune to poliomyelitis. A concise résumé of the now well known Kenny concepts of the signs and symptoms which characterize the acute stage of this disease is presented. The principles of the Kenny method are briefly discussed. Nothing new is added. No attempt is made to evaluate the method or explain the mechanism of the pathophysiologic manifestations of the disease.

The Kenny Treatment in Acute Poliomyelitis: A Report of the First Year at the Iowa Lutheran Kenny Cottage. J. E. Dyson.

J. Iowa M. Soc. 33:375 (Aug.) 1943.

This is a summary of 39 case histories of patients with poliomyelitis treated by the Kenny method during the first year of operation of a pavilion especially organized and staffed for the purpose. Most were treated in the early acute stage. There was one death in an adult patient with bulbar involvement, 28 were discharged "entirely well," 3 walked with a slight limp and 2 used Kenny sticks, 2 had total paralysis and were treated in the respirator. Nothing new is added in the discussion of symptomatology. The patients were given the usual general care, were on a high protein, high vitamin diet with milk added. Salt tablets were given during the hot weather. Roentgenotherapy hastened improvement in 3 out of 4 patients with nerve root involvement.

An additional 35 chronic patients were treated. In many of those, incoordinations were corrected by muscle reeducation. The importance of periodic checkups is stressed, since overactivity after discharge may be associated with a return of spasm and alteration in behavior patterns.

The Value of Physical Medicine in Treatment—Baths. Henry Hales.

M. Press. 210:71 (Aug. 4) 1943.

The introductory remarks include a definition of physical medicine and a review of the physicochemical concepts which underlie an understanding of the mechanisms by which therapeutic baths bring about their beneficent effect. Hales classifies therapeutic baths as pyretic, hyperpyretic and those in which "pyrexia is not the chief physical agent." The classification is not too logical. The technic of administration, the hazards of treatment and special indications are discussed. The paper is rather confusing and not in accord with current American views. For example, we do not consider electromagnetic and electrostatic field heating to be "pyretic baths."

The importance of the knowledge of physiology is stressed, but no demonstrable evidence of a physiologic kind accompanies the major discussion of the subject matter.

The Effect of Diathermy on Brain Metabolism: Changes Produced on the Sugar, Lactic Acid and pH of the Arterial and Venous Blood for the Brain in Paralytic Patients. Joseph M. Looney, and Embrie J. Borkovic.

J. Lab. & Clin. Med. 28:983 (May) 1943.

It is pointed out that during diathermy therapy the oxygen A-V difference in patients showed a fall rather than a rise as obtained by Himwich and his co-workers. In this paper the authors report the results of hyperthermia on the sugar, lactic acid and pH of arterial and venous blood.

The procedure for obtaining blood samples was the same as was reported by the authors in an earlier paper.

The changes produced by elevation of temperature in twelve patients receiving diathermy treatments are given. There was a slight but no significant increase in sugar utilization and a significant increase in pH. The lactic acid A-V difference becomes reversed so that during the period of continued temperature elevation, lactic acid is produced. This would explain, in part, the slight increase in the A-V difference for blood sugar. The observation confirms those previously reported, that there is no increase in brain metabolism during diathermy.

The Early Treatment of Strains and Sprains by Graduated Muscular Contractions. Morton Smart.

Brit. J. Phys. Med. 6:76 (May-June) 1943.

The general effects of treatment of injured muscles and joints by electrical stimulation, which produces graduated and controlled contractions and relaxations, are briefly summarized.

Muscle elasticity, irritability and contractility, that is muscle tone, are rapidly restored to normal. A great increase of blood is brought to the muscles and to neighboring tissues with all the attendant beneficial physicochemical consequences. Waste tissue products are rapidly cleared away and stagnation of lymph with its serious sequelae is prevented. A large supply of oxygen and nourishment is brought to the injured part. Rapid absorption of fluid and extravasated blood is actively promoted. Beneficial chemical and physical changes after muscle activity take place. The movements of muscles and their tendons do not allow organization of lymph to take place between their surfaces and thus the danger of adhesions is minimized. As the movements do much to prevent stagnation of lymph in the areolar tissue in the joint interspaces, the danger of the areolar tissue losing the suppleness, pliability and flexibility so necessary for efficient joint action is diminished. If, in the later stages of sprains, adhesions have formed in the muscles and periarticular tissues, the adherent surfaces are gently and gradually torn apart by separately causing increasingly powerful contractions of the muscles. Muscles are prevented from wasting, particularly if treatment is given soon after the injury; muscles already wasted increase in bulk.

It should be borne in mind that although the method of arousing muscle activity by electrical stimulation is advocated, the moment when voluntary movements can be initiated and carried out is well understood and such voluntary movements are encouraged, when practical. I do not advocate the supplanting of voluntary movements by those of electrical stimulation for one moment longer than is necessary.

Many cases can be cited in which injury to the soft structure limits voluntary muscle contractions because of pain as well as structural

damage. Such muscles can be given graduated contractions painlessly immediately after the injury resulting, at this early stage, in the beneficial physicochemical changes referred to, whereas if they are not so treated valuable time is lost before the muscles have recovered sufficiently for the initiation of voluntary contractions. It should be remembered also that in the later stages of injury, when muscles have become atonic and wasted, a point may be reached at which only limited muscle contraction can be initiated voluntarily. In such cases the beneficial effect of graduated contractions produced by electrical stimulation carried out on the lines of the technic described, has only to be seen in order to bring full realization of the inestimable value of this method of muscle treatment.

Treatment of Immersion Foot by Dry Cooling.
C. C. Ungley.

Lancet 1:681 (May 29) 1943.

Webster and his colleagues (1942) treated cases of immersion foot in the hyperemic stage by dry cooling. Cooling was achieved in one of three ways: (a) dry ice-bags were placed round each foot and changed every four hours or oftener if necessary, to reduce skin temperature by about 6 degrees C.; (b) the feet were fanned with air cooled by cold water sprayed from a nebulizer; (c) the feet were exposed to room temperature in a cool ward. Pains were relieved and within four hours patients were comfortable. Edema usually subsided rapidly and contents of blebs were absorbed. In several instances impending gangrene was arrested. Too early removal of the icebags was followed by increasing edema and even extravasation of blood. The cabinet under construction consists of an upper and a lower compartment. The upper compartment contains a tray for solid carbon dioxide. The lower compartment has padded apertures for hands or feet. It contains a thermometer which registers at the back of the cabinet. Air circulates through two flues between the compartments. By the opening and the closing of these flues the temperature of the lower compartment can be decreased or can be increased.

Since a previous report (Ungley and Blackwood, 1942) an opportunity has arisen to try out methods of dry cooling in immersion foot in the hyperemic stage.

Five Hundred Cases of Myalgia in the Army.
Michael Good.

J. Roy. Army Med. Corps 80:237 (May) 1943.

Myalgia is a disease localized frequently in certain anatomic parts of one or more muscles. Its characteristic features are "myalgic spots" which can be located by objective criteria and give rise to referred or heterotopic pain. Myalgia is present in and responsible for the vast majority—according to statistics 95 per cent—of patients suffering from rheumatism; it is not rarely asso-

ciated with rheumatoid arthritis, osteoarthritis and commonly with rheumatic fever. The malady is also responsible for a number of minor diseases which can be traced to an injury, traumatic myalgia. It is often of unknown origin, idiopathic myalgia, and mimics visceral and nervous diseases, heart pain, neuralgia, sciatica, syndrome of painful feet, etc. The localization of the myalgic spots, the characteristic feature of myalgias, of neck, shoulder, arm, back, lumbar region, hip and leg are described. Procaine injection into myalgic areas that have been accurately and objectively located is recommended to relieve pain.

Effect of Exercise on Blood Pyruvic Acid. Observations on Trained and Untrained Normal Subjects and on Patients With Heart Disease and With Hypertension. Zale A. Yanof.

Arch. Int. Med. 72:239 (Aug.) 1943.

An increase of lactic acid in the blood and tissues following exercise is one of the classic observations in physiology. Since this discovery an extensive literature has accumulated on changes in lactic acid as related to work, training and fatigue. More recently Dill and his group have suggested that it be employed as an index of cardiovascular fitness. However, it is now the considered opinion of most biochemists that pyruvic acid, and not lactic acid, is the core of the carbohydrate metabolism of tissue. In the breakdown of dextrose by the tissues all reactions appear to revolve around pyruvic acid as the pivotal point. Further interest has been attached to pyruvic acid because of Peters' discovery that the presence of vitamin B₁ is necessary for its oxidation. This displacement of lactic acid in the scheme of the carbohydrate metabolism of tissues by pyruvic acid led to the formulation of this work.

The author concludes that ten minutes after moderate exercise a group of trained subjects had no significant change in blood level of pyruvate, while untrained subjects and patients with heart disease and with hypertension had in contrast marked rises of pyruvate in the blood.

The sixty minute changes of the group of patients with heart disease were significantly high and were proportional to functional capacity.

Blood pyruvate measurably increases after moderate exercise in untrained subjects and in patients with cardiovascular disease, while lactate does not, and so estimations of pyruvate can be utilized in the study of cardiovascular fitness of untrained subjects and patients who are not capable of undertaking the strenuous exercise that measurement of blood lactate requires.

Intensive Methods of Treating Syphilis. H. N. Cole; E. B. Heisel, and George Stroud III.

J. A. M. A. 123:253 (Oct. 2) 1943.

It is the opinion of the authors that at least for the duration all such uncooperative patients with early syphilis as come to our public health

clinics should be hospitalized and treated by intensive methods, i. e. the intravenous drip, the Schoch method, the hypertherm treatment plus intravenous medication or by the Thomas and Wexler method. Stokes thinks the future should look to the multiple dose technic of Eagle and Hogan or to a combination of two or three sharp prolonged pyrexial rises with massive dose mapharsen therapy by drip or multiple injections. For such patients as are seen in clinics the answer is not to be found in the Eagle technic—the patient must be hospitalized and treated while we have him and for that reason the Thomas and Wexler technic with daily injections of mapharsen 0.060 Gm. plus intravenous typhoid-para-typhoid on the second, fourth, sixth and eighth days, the five day intravenous drip perhaps with added soluble bismuth intramuscularly, or the hypertherm plus intravenous chemotherapy are preferable. It stands to reason that such therapy should be administered only by experts in the field, trained to meet any emergency. Attempts at this type of therapy by the tyro can only lead to disaster. Moreover, such therapy requires a competent house staff and nursing staff skilled in handling such cases.

The Human Skin as a Conductor of 60-Cycle Alternating Current of High Intensity, Studied on "Electroshock" Patients. Hans Lowenbach, and Jasper E. Morgan.

J. Lab. & Clin. Med. 28:1195 (July) 1943.

The reactions of the living human skin as a conductor of 60-cycle alternating current up to 1,000 milliamperes was studied on 31 mentally ill persons in 98 experiments. When 50-120 volts are given for 0.1-0.4 sec., the impedance drops instantaneously to a value between 270 and 120 ohms regardless of the original impedance, provided this is kept at or below 2,000 ohms. Under these circumstances there is no further change of the impedance during the time of current flow. When the current is broken, the impedance—to 20 microvolts—rises suddenly 80-150 ohms, depending on the "shock" tension applied; it then increases over a period of many seconds, approaching the original value asymptotically. The skin of human corpses reacts similarly to that of living individuals, but the impedance drop is less the longer the interval between the time of death and of examination.

Some Problems of Rehabilitation. Harold Balme.

Brit. M. J. 4305:47 (July 10) 1943.

Rehabilitation is defined as the method by which physiologic and psychologic function are fully restored after their temporary loss from injury or illness. An organized system of rehabilitation should be regarded as an integral part of the treatment of all debilitating diseases and injuries. It is essential that it should not be divorced from medical and surgical control, but such dissociation is liable to occur unless its

problems are closely studied by the profession and a sound scheme is adopted by all hospital authorities. As a guide to the formulation of such a scheme a list is suggested of subjects on which further research and statistical study are required. A system by which patients undergoing rehabilitation are graded according to their stage of recovery is recommended. The various groups which should constitute a rehabilitation team and the responsibility devolving on each, are outlined. The training of the rehabilitation staff and the provision of the facilities required by hospitals and by special rehabilitation centers are discussed. The contribution of rehabilitation medical officers and of hospital social workers towards the resettlement of patients in industry is indicated.

Infectivity of Fluorescent Hairs in Scalp Ringworm. D. E. H. Cleveland.

Canad. M. A. J. 49:280 (Oct.) 1943.

Hairs which show characteristic fluorescence under a Wood's filter are usually infected with living fungus which will produce typical growths on suitable media and will produce infections that are typical, clinically when inoculated on susceptible animals. Children who react clinically negative but who are Wood-filter positive are potential sources of infection for others.

The Relationship of Dehydration and Overhydration of the Blood Plasma to Collapse in the Management of Artificial Fever Therapy. Herbert R. Brown, Jr.; William F. Clark; Nathaniel Jones; Johanna Walther, and Stafford L. Warren.

J. Clin. Investigation 22:471 (July) 1943.

The incidence of collapse during artificial fever therapy can be greatly reduced by judicious replacement of water and sodium chloride lost in sweat. The development of collapse is found to be associated with dehydration and, occasionally, overhydration of blood plasma. The symptoms resemble those of traumatic shock; pallor, cold extremities and high body temperature, absence of sweating and urinary excretion, mania or unconsciousness. There is therefore need for a guide to control the water and salt intake. This is satisfactorily provided by measurement of plasma specific gravity. This easily obtainable datum dependably forecasts the development of collapse and is therefore an extremely important item of procedure in artificial fever therapy.

Diathermy Coagulation in the Treatment of Angiomatosis Retinae and of Juvenile Coat's Disease: Report of Two Cases. Jack S. Guyton, and Francis H. McGovern.

Am. J. Ophthal. 26:675 (July) 1943.

In a patient with early angiomatosis retinae of the right eye and advanced angiomatosis retinae of the left eye, the angiomatous masses

were obliterated by diathermy coagulation. The sites of the angiomatous masses became scars and the dilated retinal vessels were reduced in size. Vision was completely preserved in the right eye; the ophthalmoscopic appearance of the left eye improved, although vision was not regained in this eye.

In a patient with early juvenile Coat's disease of the right eye and complete blindness of the left eye from massive exudative retinitis, the left eye was enucleated because of early phthisis. Histologic examination of this eye showed a few areas of capillary proliferation in the retinal lesions somewhat suggestive of angiomatosis retinae. The primary peripheral retinal lesion in the right eye, which had steadily progressed in size for eleven months, was obliterated with diathermy punctures. The site of the peripheral lesion became a scar, edema of the disc and a subretinal exudate below the disc disappeared and vision was completely preserved.

Psychoneurosis in the Canadian Army Overseas.

H. H. Hyland, and J. C. Richardson.

Canad. M. A. J. 47:432 (Nov.) 1942.

The authors have been impressed with the much greater incidence of anxiety states than of hysteria amongst the soldiers. In the last war the proportion of hysteria cases was reported to be much higher. One reason for this variation probably is the difference in precipitating factors. In this war, there have been more prolonged and less intense causes of stress, such as domestic worries, etc., rather than the acute situations with violence, great fatigue and fear in battle. Another important factor is that, with the development of interest in and understanding of psychosomatic disorders in the past twenty-five years, mental symptoms are more readily recognized and accepted and hence, the physician is more freely consulted.

When possible, the medical officer should direct the man to the proper channels for help in the solution of his army or domestic problem; when the problem is insoluble every effort should be made toward achieving a reasonable philosophic outlook and avoiding continued emotional thinking about it.

Treatment is primarily along these lines, with repeated talks and the addition, in selected cases, of other measures such as hypnosis, use of sodium pentothal, suggestion by use of faradism and, occasionally, prolonged narcosis. Occupational therapy, remedial exercises, sports and entertainment have been found most helpful adjuncts to treatment, chiefly through providing a planned regimen of early rehabilitation. Needless to say, a hospital designed specially for treatment of neurosis has special requirements of personnel, organization and equipment not found in the general military hospital.

Of 1,171 patients admitted to the hospital during a period of eighteen months, it was seen that 55 per cent of the 649 patients with psychoneurosis returned to duty.

It may seem rather startling that only about 25 per cent of the patients admitted to the hospital return to duty and carry on efficiently, willingly and symptom-free, particularly as they have not been exposed to the strain of active warfare. However, it must be taken into account that many of the other 75 per cent should never have been taken into the army, because of their nervous instability.

The Effect of Postural Hypertension on the Development of Atheromatosis in Rabbits Fed Cholesterol. Sigmund L. Wilens.

Am. J. Path. 19:293 (March) 1943.

In the course of some experiments originally designed to determine the effects of posture on the distribution of atheromatous lesions in the arteries of rabbits on high cholesterol diets, it was observed that rabbits maintained in an upright position for several hours daily during the feeding period developed more abundant lesions than control animals. There are a number of ways in which the change in posture may produce this result. The metabolism of cholesterol may be changed, the arterial wall may be subject to greater stress and strain and, finally, altered dynamics of blood flow may be implicated. In this report data are presented which indicate that elevation of blood pressure is the chief mechanism involved.

The systolic blood pressure of rabbits placed in upright sitting position in glass jars is significantly elevated. This elevation persists during the entire period of postural change, but the blood pressure returns to normal when the rabbits are removed from the jars. This elevation of pressure occurs not only in normal rabbits but in those previously rendered hypertensive by unilateral cellophane perinephritis followed by contralateral nephrectomy.

Rabbits fed high cholesterol diets and placed in the upright sitting position for five hours daily develop more abundant intimal deposits of lipids in their aortas than rabbits fed equal amounts of cholesterol but not subjected to postural change. The intimal lesions develop more quickly, are larger and tend to be more widely distributed over the entire aorta, including the abdominal portion.

It seems reasonable to conclude that even moderate degrees of elevation of blood pressure facilitates the passage and retention of lipids in the aortas of cholesterol fed rabbits.

Urban Air Pollution and Respiratory Diseases. Clarence A. Mills.

Am. J. Hyg. 37:131 (March) 1943.

There exists a highly significant relation between atmospheric pollution (sootfall) and respiratory disease death rates in the various districts of Cincinnati and Pittsburgh. This hazard involves particularly the men living and working

in the badly polluted industrialized districts of the two cities. Even the females of these districts show much more respiratory disease than is found in the hilltop suburbs, but the male rates rise two to three times more than the female. Little difference between male and female rates exists in the suburban areas of these two cities or among rural residents of Ohio. Exhaust steam from the power sources adds greatly to the winter smoke problem by remaining as a fog to hold the flue products suspended in the air the people must breathe. Remedial steps should include: (a) use of low-volatile coal or proper equipment to burn high volatile varieties smokelessly; (b) effective trapping of fly-ash in chimney or stack; (c) preliminary washing of high-sulphur coals; and (d) use by the railroads of Diesel or electric power within metropolitan limits.

Treatment of Acne Vulgaris With Comedones by Monoterminal Electrodesiccation. Ruben Nomland.

Arch. Dermat. & Syphil. 48:302 (Sept.) 1943.

Bloch, in discussing the cause of acne, stated: It is well known that the development of a typical case of acne has two chronologically separate phases. The first is characterized by the formation of comedones. This (according to Unna) is caused by a thickening of the corneous layer at the outlet of and within the follicular duct, behind which the secretion of the sebaceous gland is blocked up. Only this phase of acne can be brought into direct relation with the endocrine processes in the sexual glands. The second phase of acne is characterized by an inflammatory and suppurative process on a basis of infection. . . . There is no consensus as to the actual cause of the infective inflammation.

Destruction of comedones and milia by monopolar electrodesiccation was carried out in 31 patients with various types of acne who had not responded to simple treatment. Excellent results followed in 25 patients. The best results were obtained in the mild acne of adolescents and in the superficial type seen mostly in women in their mid-twenties.

Acne of the acne conglobata type did not respond, but patients with less severe eruptions had a good response, particularly when desiccation was combined with roentgen treatment, a method which was used for 7 patients.

A Follow-Up of 100 Cases of Schizophrenia Treated by Combined Insulin and Electrical Convulsion Therapy. John H. Ewen.

Practitioner 151:109. (Aug.) 1943.

Insulin therapy combined with electrically-induced convulsion therapy is a form of treatment for schizophrenia from which favorable results

can be expected in suitable cases. When carried out by an experienced staff it is safe, convenient and of moderately short duration. In cases in which good results have been obtained the benefit conferred by treatment is maintained after discharge from the hospital and the patient is able to resume work and to come with increasing demands for adaptation.

Suitable home and employment conditions after discharge are of the greatest assistance in obviating relapse and in this connection the female patient would appear to be at some advantage over the males as being exposed to less stress. Rehabilitation, as advocated in the Tomlinson report, with selected employment, continued after-care, and, in suitable cases, a reconditioning course, would be particularly beneficial in patients with schizophrenia that have received specialized treatment and would do much to prevent relapse and to restore the patient to normal life.

Electric Shock Therapy in the Psychoses. A Study of 100 Cases. Joseph Epstein.

J. Nerv. & Ment. Dis. 98:115 (Aug.) 1943.

The application of an electro-cerebral shock will result either in a grand mal convulsion or a petit mal reaction. The latter occurs when the treatment current is below the convulsive threshold. Petit mal reactions produce unconsciousness and amnesic phenomena, just as do the grand mal reactions. They vary in intensity from very mild reactions to severe ones bordering on the grand mal and having all its features, but not associated with a convulsion.

Electro-cerebral shock causes mass cerebral and autonomic nervous system irritation, the manifestations of which are profound effects on the heart rate, blood pressure, pupils, state of muscular tonus, mental equilibrium, etc. A chart is demonstrated in which the degree of these effects can be classified in terms of 1+, 2+, 3+, 4++, when 1+ is the mildest type of reaction and 4++ is a severe convulsion associated with prolonged apnoea and frequent cardiac standstill. Convulsive reactions are most desirable for treatment purposes, but 3+ petit mal reactions can be satisfactorily utilized in certain instances. In a series of 100 patients treated, the type of cases which responded best were the clear-cut manic-depressives and the involutional, melancholias. Schizophrenia and mixed psychoses in which paranoid and delusional trends predominated did poorly. Where the duration of the illness was less than six months the general outlook for improvement or recovery was better, irrespective of the type of psychosis.

Electro-cerebral shock is more easily administered and less hazardous than insulin or metrazol.

SCHOOLS APPROVED FOR TRAINING PHYSICAL THERAPY TECHNICIANS

By the Council on Medical Education and Hospitals of the American Medical Association *

Name and Location of School	Emergency Course					Regular Course				
	Medical Director	Entrance Requirements †	Length in Months	Classes Start	Tuition	Certificate, Degree, Diploma	Length in Months	Classes Start	Tuition	Certificate, Degree, Diploma
Army and Navy General Hospital, Hot Springs National Park, Ark.										
Children's Hospital, Los Angeles ¹	Capt. Walter J. Lee, M.C.	b	6	Oct	None	Certificate	12	Feb/Aug	\$200	Diploma
College of Medical Evangelists, Los Angeles ¹	Steele F. Stewart, M.D.	a-b-c	6	Feb/Aug	\$200	Certificate	12	Jan/July	\$200	Certificate
University of California Hospital, San Francisco ¹	Fred B. Moor, M.D.	a-b-c	...	...	...	...	12	Feb	\$150	Certificate
Stanford University, Stanford University, Calif. ¹	Frances Baker, M.D.	a-b-c	...	...	...	...	10	Quart.	\$401	Cert. or Degree
Fitzsimons General Hospital, Denver	Wm. H. Northway, M.D.	a-b-d ²	7	Quart.	\$286	Certificate	...	...	...	...
Walter Reed General Hospital, Washington, D. C.	Maj. O. L. Huddleston, M. C.	b	6	Oct	None	Certificate	...	...	...	...
Northwestern University Medical School, Chicago	Capt. D. L. Rose, M. C.	a-b-d	6	Quart.	None	Certificate	9	July/Oct	\$200	Certificate
State University of Iowa Medical School, Iowa City	John S. Coulter, M.D.	b-c	6	Mar/Sept	None	Certificate	9	Mar/Sept	None	Certificate
Bouvé-Boston School of Physical Education, Boston	William D. Paul, M.D.	a-b-c ⁶	6	June	\$250	Certificate	3-4 yrs.	Sept	\$400/yr.	Dipl. or Degree
Harvard Medical School, Boston	Arthur L. Watkins, M.D.	a-b-c	6	Mar 15	\$200	Certificate	9	June	\$250	Certificate
Boston University Sargent College of Physical Education, Cambridge, Mass.	Frank R. Ober, M.D.	a-b-c	...	...	...	...	24	Jan/Oct	\$435 yr.	Cert. & Degree
University of Minnesota, Minneapolis ¹	Louis Howard, M.D.	a-b-c ³	...	...	...	...	12	Summer	\$1124	Certificate
Mayo Clinic, Rochester, Minn. ¹	Miland E. Knapp, M.D.	a-b-c	6	Jan-July	None	Certificate	9	Jan/July	None	Certificate
Barnes Hospital, St. Louis	Frank H. Krusen, M.D.	a-b-c	...	...	...	...	9	Oct	\$200	Certificate
St. Louis University School of Nursing, St. Louis ¹	Frank H. Ewerhardt, M.D.	a-b-c	...	...	...	...	4 yrs.	Jan/Sept	\$250 yr.	Cert. or Degree
O'Reilly General Hospital, Springfield, Mo.	Alexander J. Kotkis, M.D.	HS	...	...	...	...	1-3 yrs.	Feb/Sept	\$350	Cert. or Degree
University of Buffalo School of Nursing, Buffalo ¹	Maj. John H. Aldes, M. C.	b	6	Oct	None	Certificate	9	Sept	\$300	Diploma
Hospital for Special Surgery, New York City ¹	George G. Martin, M.D.	a-b-c	6	Feb/Sept	\$420	Certificate	9	Feb/Sept	\$396	Cert. & Degree
New York University, New York City ¹	Kristian G. Hansson, M.D.	a-b-c	...	...	...	...	9	Sept	None	Certificate
Cleveland Clinic Foundation Hospital, Cleveland	William Bierman, M.D.	a-b-c	...	...	...	...	...	...	...	...
D. T. Watson School of Physiotherapy, Leedsdale, Pa. ¹	Walter J. Zeiter, M.D.	a-b-c	...	...	...	...	12	July	\$200	Diploma
Graduate Hosp. of the Univ. of Pa., Philadelphia ¹	Jessie Wright, M.D.	a-b-c	6	Jan/July	\$200	Diploma	12	Sept	\$200	Certificate
Brooke General Hospital, San Antonio, Tex.	Wm. T. Johnson, M.D.	a-b-c	...	...	...	...	...	...	...	...
University of Wisconsin Medical School, Madison	Maj. Albert Loisel, M. C.	b	6	Oct	None	Certificate	9	Oct/April	\$964	Certificate
Richmond Professional Institute, Richmond, Va.	F. A. Hellebrandt, M.D.	a-b-c ⁴	6	Oct/April	\$724	Certificate	9-12	Sept	\$200-220	Certificate
Duke Hospital, Durham, N. C.	T. W. Wheelond, M.D.	a-d ⁶	...	...	...	...	9	Sept	Univ. fees	Certificate
	Lenox D. Baker, M.D.	b-c	...	...	...	...	...	...	...	...

† Courses are so arranged that any of the entrance requirements will qualify students for training. a. = Graduation from accredited school of nursing; b. = Graduation from accredited school of physical education; c. = Two years of college with science courses; d. = Three years of college with science courses; HS = High school graduation.
1. Male students are admitted.
2. High school graduates accepted for a four-year course leading to A.B. degree;

students admitted quarterly and tuition is \$143 per quarter.
3. Medical technology graduates with B.S. degree also admitted.
4. Nonresidents charged additional fee.
5. Those with degree from other colleges also accepted.
6. High school graduates admitted to regular course.
• Reprinted with permission.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Archives of Physical Therapy, published Monthly at Chicago, Illinois, for October 1, 1943.
State of Ohio, } ss.
County of Cuyahoga, }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Walter J. Zeiter, M.D., who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Archives of Physical Therapy, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Name of Publisher—American Congress of Physical Therapy, 30 North Michigan Ave., Chicago 2, Illinois.

Members of Editorial Board, ARCHIVES OF PHYSICAL THERAPY.

John S. Coulter, M.D., 122 South Michigan Avenue, Chicago, Illinois.

Earl C. Elkins, M.D., Rochester, Minnesota.

Richard Kovács, M.D., 2 East 88th Street, New York, N. Y.

Fred B. Moor, M.D., 312 North Boyle Avenue, Los Angeles, California.

Walter M. Solomon, M.D., 1626 B. F. Keith Building, Cleveland, Ohio, (Now in Active Service).

Arthur L. Watkins, M.D., Massachusetts General Hospital, Boston, Massachusetts.

Managing Editor—None.

Business Manager—Walter J. Zeiter, M.D., Cleveland Clinic, Cleveland, Ohio.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of

stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

American Congress of Physical Therapy, 30 North Michigan Avenue, Chicago 2, Illinois.

President—Kristian G. Hansson, M.D., 525 East 68th Street, New York, N. Y.

Secretary—Richard Kovács, M.D., 2 East 88th Street, New York 28, N. Y.

Treasurer—John S. Coulter, M.D., 122 South Michigan Avenue, Chicago, Illinois.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)—None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Walter J. Zeiter, M.D.

Sworn to and subscribed before me this 19th day of October, 1943.

Myrtle M. Fennell, Notary Public.

(My commission expires July 30, 1945.)

WANTED

BACK ISSUES OF THE ARCHIVES

Copies of March, 1943 and of March, 1942 of the
Archives of Physical Therapy.
are solicited. Mail to

AMERICAN CONGRESS OF PHYSICAL THERAPY

30 N. Michigan Avenue

Chicago 2